PAVING AND MUNICIPAL ENGINEERING

A Journal Devoted Specially to Street and Sidewalk Paving, Sewerage, Water-Works Construction, Street Lighting, and all Matters Pertaining to Municipal Engineering.

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Articles relating to the different branches of municipal engineering are desired. Stamps should accompany manuscripts for return postage if unavailable.

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The columns of this publication are open to the discussion of all subjects relating to paving, sewerage, water-works, street-lighting, and the physical improvement of cities. Practical information as to the merits of materials used in such work and new methods, with photographs and drawings, which may be used for illustration, are especially desired. We are glad to get brief notes as to proposed improvements and the letting of large contracts.

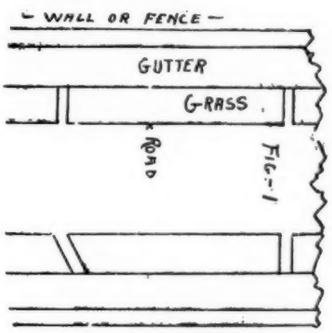
City engineers are requested to send us as early as possible copies of their annual reports, which will be given proper notice.

Articles relating to methods of road making and maintenance are invited.

THE COUNTRY ROADS OF FRANCE.

By Louis H. Gibson.

I HAVE at this time broader practical information on the subject of the country roads of France than some months ago when I wrote on this question. At that time I had been studying, in the book of instructions formulated by the French government for the benefit of road viewers and inspectors, their system of caring for and administering this work. I had seen enough then to know that the study was well worth the time, but during the last five weeks I have been walking and driving by stage through quite a portion of western and northwestern France, and, having this subject of roadways in mind, I have seen many things which might not otherwise have come to my attention.

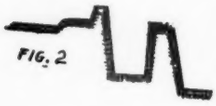


A BIT OF ROAD.

The drawings which I submit herewith give the general form and arrangement of the roads. There is, in the center, the roadbed proper, which varies in width from fifteen to eighteen feet. The large roadways are the latter width, and others vary from fifteen feet up. On each side of the road bed is a grass plot usually six feet wide, though sometimes two feet wider. On each side of the grass plot is the main drain, which varies from four to six and seven feet in width. Not all of this latter space is used as a drain, however. When it is very wide the drain is cut into it on the side next to the grass plot. On the outside of the drain are the walls or fences. In this part of the country they are nearly always of sod or stone, usually the former. Sod is piled up, sometimes a little stone is worked in with it to give solidity, and in this wall trees are planted so that they grow from the ground below up through it.

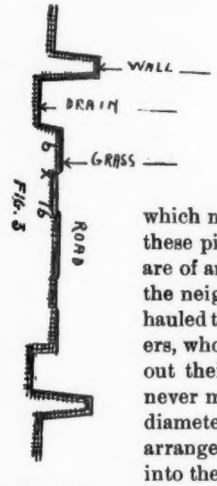
Many of these walls were built shortly after the revolution when the farms were divided and many of the roadways inaugurated, and the trees were planted during and after that time. They are now quite large and add greatly to the beauty of the scenery. It often happens that trees are planted in the grass plot on each side of the roadbed. This has the effect of covering the entire roadway with foliage. I noticed that for this row of trees beech is frequently used, and I was a little surprised to see that they stood transplanting so well. However, differences in soil, or possibly in the tree itself, may make this a different matter than with us, where, I understand, beech does not admit of successful transplanting. The marks in the drawing across the grass plot are gutters which connect the roadway with the main gutter on the outside. These are usually from sixty to one hundred feet apart, their spacing depending upon the grade of the roadbed itself. When there is some little slant they are not so close together as when the road is comparatively flat. In the latter instance they are as close together as sixty feet. Otherwise they are a hundred. When the incline of the road is quite perceptible, the gutters run across the grass plot diagonally in the direction of the downward movement of the road. One such diagonal cross gutter is shown by the dotted line of figure 1. These little drains, though not more than four to six inches in depth and one foot wide, are carefully looked after. They are kept in good form by being trimmed out smooth and all the grass regularly removed. It is regarded as a very important feature that these roads should be well drained. We have walked over many miles of them, immediately during and after a rain, and never so much as seriously soiled our shoes. There is not a suggestion of mud or standing water at any place on the roadway. The drain is immediate and perfect.

Figure 2 shows a little protecting bank on the outside of the grass plat where there is a deep cut on the side of the road. Figure 3 is a section of the ordinary road. All of these roadways are macadam, or broken stone. The road-bed is of varying depth. According to the French system of caring for a road, which means never to let it get out of repair, even a little, any roadway is a good road, for no matter how bad it may be at the beginning, the attention which it receives will soon put it in a satisfactory state.



A PROTECTING BANK.

Piled on the grass plats, along the sides of the roadway, are quantities of broken stone.



Usually there is two to two and a half yards of stone in each of these piles. They are there ready for any defect which may show in the road-bed. Generally these piles are from 200 to 250 feet apart, and are of any kind of stone which happens to be in the neighborhood. The stone, in small blocks, is hauled there and broken on the spot by the farmers, who, by this and other means, usually work out their road tax. The size of the pieces is never more than two and a quarter inches in diameter. When broken into these sizes all is arranged neatly and regularly by throwing it into the opening of an inverted hopper, which, when lifted, leaves the stone in a neat pile. As fast as any of the stone is taken away for repairs it is replaced by other material, and the stone pile kept in neat and regular form.

The depth of the bed depends, to some extent, on the character of the bottom. I have seen some roads where it was ten inches thick, others deeper and still others shallower. A macadam road which is looked after all the time, as are these, improves constantly, until the state of perfection is reached.

These macadam roadways have exactly the right kind of surface for the comfort of the horse, are never slippery, not noisy, as roadways go, and are as easily kept free from dust as any other road covering. In Pontivy, which is quite a little city, there are the stone pavements which were put down by Napoleon in one part of the town, and macadam which was there before. As far as travel was concerned there could be not the least question. The macadam road was much smoother, and for that reason was cleaner and more easily kept clean than the stone block covering.

The macadam roadway properly constructed and cared for while it is unquestionably the only road for the country, is valuable in a way we do not appreciate for towns and cities. However, there is one feature connected with this question that must not be neglected for a minute. No city or town should put down this kind of a road until it is provided with the organization to care for it. The cost of such an organization is very little, but we in America do not appreciate the necessity of caring for our roads and highways of any kind, be they asphalt, brick, block, or what not. No matter of what material we make our roads, or how much care be exercised in their original construction, it is well to bear in mind that all roads become bad roads if not regularly patrolled and cared for, and that all bad roads will become good roads if regularly patrolled and cared for. In our smaller cities and towns the macadam road is unquestionable the only one to be thought of on account of expense, but with it must come the organization for giving it regular attention. This implies vigilance, but not necessarily great expense.

A few days ago I saw pasted on the walls on one of the towns through which we passed, a notice of examination for road viewers or inspectors in that section, and as a matter of interest I state the requirements of that examination. In this connection I state that the salary was $300 a year for the class of viewer demanded at this time. Aside from the ordinary requirements of a knowledge of French history, grammar, etc., his examinations included the preparation of drawings for roadways and bridges, calculations of quantities and costs thereof. In mathematics he was expected to be familiar with plain and solid geometry, plain trigonometry, and the use of logarithms, surveying and leveling. Having passed such an examination he was eligible, by promotion, to positions of higher grade, for all of which this was the preparatory examination. These road viewers not only have to construct and care for the roads themselves, but as well the grading and draining contiguous thereto, and to build bridges, abutments and culverts. They lay out all this work and organize the working forces. A great deal of the work is done by the farmers who work out their road tax, and for which reason it would come under the category of day work in our country. There is a vehicle tax demanding cash payment, which provides the necessary cash funds for providing material and labor other than that of crude labor.

PAVING BRICK PLANT CONSTRUCTION.

By W. A. Eudaly.

JUST now I am receiving a great many inquiries about the best methods of constructing paving brick plants. There are a few general features that should be observed.

First: The dry pans or crushers should be so located with reference to the clay bank that the clay can be dumped to the crushers, in this way avoiding the great amount of manual labor that would otherwise be required to elevate the clay with shovels to the hopper of the crusher. Again, the clay should be dumped near enough to the crusher so that no conveying in wheelbarrows or otherwise is necessary. Of course, this can not be done when it is necessary to house a large amount of clay for winter use. The crusher should be between the clay bank and the pug-mill, if possible.

Second: The pug-mills should be elevated above the machinery so that once elevating the clay would carry it from the crusher to the machine.

Third: Need I mention so plain a matter as that of having the dryer and machine house in close proximity, and conveniently arranged so that the brick from the machine can be easily and quickly put into the dryer?

Fourth: Or is it necessary to say that the dryer should be conveniently situated in reference to the kilns?

Fifth: Or that the kilns should be convenient to the railroad switch or road?

Yes, it is necessary, as I have seen during the past season several plants, and I regret to say some of them were new ones where these very simple, and to most men plain, necessities were sadly overlooked or disregarded.

Sixth: The railroad switch should be convenient to the kilns and the storage sheds. This is a matter often difficult to arrange for the reason that three unwieldy elements enter into consideration—kilns, storage sheds and railroad cars. Both the storage sheds and cars should be convenient to the kilns and convenient to each other. These are requisites hard to accommodate, but as it is, no doubt, most economical to load the paving brick directly from the kilns to the cars, the cars should have the preference over the storage sheds as to position. This being the case, many plants are arranged so that the bottom of the cars come on a level with the kiln floor. This is done, of course, by lowering the railroad switch, which is very bad in winter or wet weather unless ample over drainage is provided. We know of a number of yards where the natural lay of the land is such that this arrangement can be had without excavating for the switch track. Now that the track is properly in front of the kilns, many locate the storage sheds beyond the switch track, and by the use of strong rough boards wheel the brick across the track to the sheds. Once the brick are properly hacked under the sheds along the switch, they can be easily loaded into the cars.

Of course, the floor of the storage sheds should be on a level with the kiln floor and hence on a level with the bottom of the cars standing on the switch.

Seventh: The arrangement of dryer, kilns and cars or storage sheds should always be such, if possible, that the kilns may be emptied at the opposite end from that at which they are filled with the green brick, for the reason that it is very desirous not to have the brick setters and loaders in each others' way. If care is taken at this point a great deal of annoyance and trouble will be avoided.

Eighth: The plant as a whole should be as compact as possible. I do not mean by this that the buildings should be small, for any one who has had experience knows that they should be large and roomy, but I mean that each and every department of the works should be as convenient to every other part upon which it is directly dependent.

THE DEMAND FOR PAVING BRICK.

THE demand for paving brick this year has been many times larger than ever before, and has, in fact, far exceeded the supply. Cities and towns fortunately situated in proximity to manufacturers of brick suitable for paving have been able to obtain, to some extent, what they needed, though in many cases not as rapidly as desired. In hundreds of instances, however, there have been calls for brick where they could not be furnished, because manufacturers have been unwilling to undertake to go beyond their immediate and convenient market, which they find it is most satisfactory and most profitable to give preferred consideration. Freight rates and the difficulties attending shipments of long distances involve features of the business that are shunned rather than sought when the manufacturer finds that there is a demand in more convenient markets for all that he has to sell. The paving brick manufacturers who have placed themselves conspicuously before the public by advertising in PAVING AND MUNICIPAL ENGINEERING, testify that they are offered orders from all parts of the country. The growth of this demand for paving brick in the last two years has been marvelous; it has now become well near universal in the United States, but the popularity of the material will go on increasing, and the demands for paving brick will multiply, for the need of it in carrying forward the work of street improvement is vast in extent. The demand for it and the spirit of improvement which is abroad in the land will be stimulated by the general prosperity with which we are now blessed.

It is a matter of no little gratification that this journal has had a powerful influence in awakening a better appreciation of the need of good roadways and in educating the public as to the merits of materials. We have regarded improvement as of more importance than the question of what material should be used—a question which is variously affected by many different conditions—and it is likewise now not a question of advising people what to pave with, but to look out for the material that they have decided they want. In hundreds of cities and towns the demand is for brick or nothing. They should have the brick, but there can not be an adequate supply unless more manufacturers engage in the business, properly equipped with the best machinery and with the requisite quality of clay at hand for making good pavers. Failure will inevitably overtake all who are not so equipped, while those that engage in the business in the right way are pretty sure to find it very profitable. Those who contemplate going into the business should not delay, for the prosperity of the times and the demands for the product are now at high tide. But again let all be cautioned against the dangers of faulty equipment and lack of requisite materials and knowledge.

AN ELECTRIC STREET RAILWAY MOTOR.

By John W. McNamara.

AT the time of the introduction of the electric motor, the ordinary street car drawn by horses was the most convenient vehicle in public use. It was easy to enter and easy to alight from. The various makers had vied with each other until one was able to step as easily from the street into a car as he could ascend two steps of his own stairs. The early builders of electric cars endeavored to retain this feature of the street car, and placed the motor proper *on* the car, communicating motion to the axles by means of sprocket wheels and chains; but the mechanical difficulties, and the noise made by the chains and wheels, led to their abandonment, and the motor or motors were then placed on the axles and *under* the car, where we find them to-day.

At first the easy-of-access feature was retained, but as the necessity for larger motors and more room for them became apparent, the car body was gradually raised until it is too high for children and elderly people to enter readily, and a great deal of time is consequently used in receiving and discharging passengers.

The car body has been raised at the expense of comfort, without, it seems to me, improving the condition of the motor. It is still under the car, near the mud, dust, snow and slush, and is as difficult to get at as it ever was.

With these exceptions, the electric motor of to-day, is well-nigh perfect, but these exceptions, as time goes on, will become more serious. When the novelty of being regularly and rapidly carried to their homes and places of business ceases, then passengers will call attention to the difficulty of entering and leaving cars.

The size of the motor car, especially for use on grades, should not exceed the standard 16 feet for box cars and about 25 feet for open cars. On level and suburban roads where the headway is not less than twenty minutes, larger cars with eight wheels might probably be economically used; but for populous cities where the headway is less than five minutes, the old standard car body is, in my opinion, the best.

How the motor is to be arranged with reference to the car body so as to admit of easy access to it for examination and repair may, or rather must, be left to mechanical and electrical engineers. That we will continue to drag them in the dust and mud very long I can not believe.

I think the opinion of all who are unprejudiced is that the overhead, angle trolly under-contact systems are the most reliable and efficient. With good overhead construction the loss of power in transmission is but slight, and the conductors are always where they can be seen and kept in place.

The ideal motor is one which is independent of every other motor or other engine, and contains everything necessary to make it go. This motor exists and seems to work fairly well on grades of not more than five per cent.; but that it is capable of doing the work now being done by motors using the overhead system is still problematical. However, as we have already witnessed such wonders in propelling cars by electricity, may we not hope for a storage battery electric car which shall be equal to any now in use?

HOW ASPHALT IS MINED AND PREPARED FOR USE.

By Louis H. Gibson.

THE commercial history of asphalt is not without interest, but is too long to be mentioned here otherwise than incidentally. One of the most interesting features in this history was the discussion as to the proper classification of the material, whether it should be classified as a product of mines, as are coal and iron, or of the quarry. Finally, in France the decision was given, in 1810, that asphalt is a product of the mine, that it is a proper mineral and subject to the regulations governing mines. Nearly every country producing asphalt has followed the decision of France in this matter.

Asphalt is mined at times subterraneally and at others in open mines, or those resembling quarries. The general method of extraction is about the same as that of stone. However, the material is soft enough to admit of the holes being made with an auger. At times, when it is necessary to traverse what is known here as a sterile part of a layer, it is necessary to employ tools distinctively applied to stone quarries.

The holes in the asphalt are sometimes charged with powder, sometimes with dynamite. The former is employed when the

material is in compact masses which are dry and unfissured. It is readily understood that in working in a material which is, in a certain measure, elastic, there can not be used explosives which are too violent. On the other hand, if the asphalt is humid, or if there are fissures, it is advantageous to employ dynamite which is more instantaneous than powder. The gas of the former escapes through the fissures without accomplishing the result intended.

The blocks of asphalt thus broken are transported in the ordinary manner, by means of small railroads, to the mouth of the mine, where they are piled in as low piles as possible in order to avoid the action of the sun which reduces the blocks to powder. While it is the next process in the preparation of the material to reduce it to powder, it is not advantageous to have it occur at the mouth of the mine; first, because there is more waste in handling the dust than the blocks, and again in case of rain the material absorbs a certain amount of water which renders it difficult to treat when it is employed for pavements. After it leaves the mines it is reduced to powder by machinery made specially for this purpose. It is sufficient to say of this machinery that it is the result of years of experience and experiment. The objective point is the reduction to a powder, all the grains of which are uniform. This is accomplished by first tearing it into pieces about the size of the pebbles employed in macadam roadways. These pieces are reduced to dust by centrifugal action.

This asphalt rock is employed in making two kinds of pavement. For the roadways it is transported as it leaves the pulverizer, the only after preparation being that given at the place of application. But for use as Asphalt Coule or asphalt for sidewalks it goes through a special preparation which will be described later.

In the various uses to which asphalt is put there is employed a certain amount of free bitumen. This is used to give to the rock a slight supplement of softness which it lacks, and as well to keep it from burning when it is first put into the heaters. Bitumen is used more liberally in the preparation of sidewalks or Asphalt Coule than for application to roadways. It is desirable, or one should say necessary, that the bitumen employed should approach, as nearly as possible, the character of that contained in the natural rock. If it were possible to extract from the asphalt rock itself the bitumen contained, it is evident that the result in asphalt work would be superior to that resulting from using foreign bitumen. However, the extraction of bitumen from asphalt rock is a chemical process, one pertaining to the laboratory, one so expensive and tedious that it is not possible to consider it. Therefore, engineers are forced to seek bitumen from other sources.

As stated above, a certain small proportion of bitumen is necessary in the utilization of asphalt rock or powdered asphalt. However, bitumen is more largely used in the preparation of what is known as Asphalt Coule, and because of its extensive use it is desirable that we know something of its manufacture, which is nothing more or less than a purification process. Bitumen, in a natural state, is found near the mines of asphalt and in various localities which do not necessarily produce the asphalt rock, notably Trinidad, in the Antilles, Cuba, and other parts of South America. The attempt has been made to separate bitumen from the asphalt rock, and while it is possible in laboratory practice, it is not possible on a large or commercial basis. Therefore, the coarse products of Trinidad, and elsewhere, are purified and worked into commercial bitumen.

In this connection it may be well to describe, in short form, the process of the separation of the bitumen from the impure or earthy and stony material which is found mixed with it. This impurity is common to both of the materials from which bitumen is produced; that is, the molasses bitumen or that which is found adjacent to the mines, and that which is found independent of the mines, and which is represented by the Trinidad product. We will first consider the purification of the molasses product as it has been carried on for a hundred years.

It is of a hard nature surrounding fragments of rock and pebbles. The material, as it is taken out, is first crushed and then thrown into heaters full of boiling water. It is maintained at the boiling point for about two hours. The boiling water has two effects on this mass, the heat measurably separates and liberates the bits of stone from the bitumen. Again, the bubbling action of the water makes a mechanical separation by the agitation of its movements, which allows the gravel and bits of stone to fall to the bottom and the bitumen to rise to the top. The separation is accelerated by the constant stirring of the entire mass. At the proper time the bitumen is taken off, the particles of gravel at the bottom are removed, and the heater recharged; even after this the bitumen will often contain a certain proportion of gravel, which has not been fully precipitated or settled. This is fully accomplished by boiling without water, though, otherwise, it practically amounts to a repetition of the original process. The bitumen resulting from this second operation is absolutely pure. A chemical process somewhat dangerous of operation, though less expensive in a general way, is substantially as follows:

The bituminous rock is broken and mixed with sulphur of carbon and is agitated in a closed vessel. This process has the effect of uniting the sulphur of carbon and the pure bitumen, and at the same time liberating the impurities, which sink to the bottom of the receptacle. After the proper length of time the material at the top is decanted and discharged into a heater. There we have the sulphur of carbon mixed with the bitumen, the separation of the two ingredients is made by the very simple process of distillation. As the entire mass is heated the vapor of the carbon is dicharged through an ordinary still worm, which is properly chilled on the outside by water. As the vapor is condensed it is discharged into proper receptacles for use again in the original operation of separating the bitumen from the impurities. The bitumen remaining in the heater is of the purest possible character. This operation is not in general practice because of the danger attending its use.

The purification of the bitumen of Trinidad is an operation distinct from that of the purification of molasses. In its original state it contains debris of different kinds; earth, gravel, plants which appear to have been a part of the product in its original formation. Sometimes the Trinidad is brought to the place of purification in its rough original state. Again it has been partially purified and is delivered in cakes for farther action. This material is always too dry for practical use. There are two ways of adding to it the natural oil of bitumen which it lacks. One is to extract the oil from a part of the Trinidad and throw away everything but the oil. This is added to the Trinidad product, or rather the Trinidad is added to it during the process of purification. A similar oil is extracted from the schists of the asphalt mines. Three hundred parts to three hundred and fifty parts of this oil are placed in the heater. After it has reached the boiling point small broken parts of the unpurified Trinidad product are thrown into the boiling mass. It is added in small quantities until the entire mass represents thirteen hundred parts. This stage of the process develops into one of great activity in the boiling, and great care has to be exercised to prevent accident and waste from its boiling over. This great activity is caused by the water which represents about two hundred and eighty of the thirteen hundred parts. After it has been all evaporated, the action becomes less violent. This, in itself, indicates the absence of the water. The material is then decanted, leaving 70 per cent. of deposit and a remaining product of nine hundred and fifty parts of commercially pure bitumen. We say commercially pure, because there is in it yet 25 per cent. of clay or other earth, impalpable and inoffensive.

The quantity of oil added to the bitumen in its purification depends upon the climate in which the bitumen is to be used. In the warm climates less oil is used than in the colder ones. The exact amount is a matter of judgment.

Paris, August 21, 1891.

REPLY TO THE OMAHA BOARD OF PUBLIC WORKS.

IN reply to the statements of the Omaha Board of Public Works, regarding the asphalt pavements put down in that city by the Barber Company, published in the September number of PAVING, the following has been received from Mr. C. E. Squires, who says in a letter accompanying it: "I could readily obtain a thousand signatures among the best men in this city had I the time and you the space to spare. The gentlemen who drew up this report desired to be moderate, while a majority of those signing it insisted it is too mild:"

OMAHA, NEB., Sept. 24, 1891.

C. E. Squires, Agent Barber Paving Co., Omaha, Neb.:

DEAR SIR—You desire to know whether the intelligent citizens of this city concur in the statement of its Board of Public Works as to Trinidad Sheet Asphalt pavements, in its annual report for 1890. In reply we have to say:

1st. That we do concur fully with that portion which asserts that "newly laid Trinidad Sheet Asphaltum is beyond all question the finest appearing material in use for paving, combining as it does so many desirable properties. It is smooth, noiseless, easy to clean and keep clean, impervious against absorption of all matter deleterious to health, as well as preventing unhealthy exhalations from the earth in the surface covered, is capable of being laid in almost any form of adjustment to adjoining material, and while dry and unfrozen is not slippery."

We not only concur in the above, but after an experience of about nine years with this pavement, we feel warranted in further asserting that its use is more conducive to enjoyment and comfort, is more economical in indirect expenses, such as wear and tear of horses and vehicles, the washing of vehicles, abuse of horses, lost time, etc., etc., and that there is a greater volume of traffic on the streets where it is used than on other streets adjacent and similar in every respect, paved with any other material; therefore it increases the actual and rental value of real estate on streets where it is laid, more than any other material.

This much is practically conceded in said report and is backed by a large preponderance of public sentiment in this city after an experience of nearly nine years.

2d. It is stated in said report that "when asphalt streets are being sprinkled or the surface frozen, it is very slippery, even upon the level streets."

We are confident that eight out of ten who constantly drive on our streets will testify that the asphalt streets, level or otherwise, are not as slippery as either granite or cedar block streets when wet or frozen.

3d. The balance of said report so far as it relates to asphalt pavements is devoted to assertions as to its being "very expensive in any and all its forms, heretofore being entirely in the hands of a corporation known as the Barber Asphalt Paving Company, who have faithfully wrung from the public the very highest price possible to obtain," that "it requires careful and constant repairs, the cost of which are simply excessive," and then indulges in a long array of statements and figures, attempting to prove that said pavement in its first cost of construction and its subsequent cost of repairs might be reduced to one-half its present cost to tax-payers, and still leave the contractor in the enjoyment of 25 to 50 per cent. net profit.

These statements may or may not be true; we have never attempted to prove or disprove them.

Nine years ago the Barber Company presented this new material for pavements to our citizens for consideration and informed us that the first cost and its repairs and maintenance for five years after the date of acceptance would be $2.98 per square yard, and that after the expiration of the said five years, it would cost us not to exceed ten cents per square yard per annum for all asphalt laid, whether requiring repairs or not.

We laid some of it, and after the expiration of the first five years we entered into a ten year contract with said company for its repairs and maintenance at eight cents per square yard, two cents less than the maximum at first fixed by the company. This historical statement is made for the purpose of showing that the business transactions of said Barber Asphalt Company with this city have been an open book from the first to the last, without any misunderstandings on the part of either, and that no late discoveries have been made which should cause any friction whatever. We have 11 miles of this pavement; 4½ of the same was laid last year, demonstrating its growing popularity on the part of property owners who, by majority petitions, demanded its use.

Finally. It is generally understood in this community that this report so far as it refers to the Barber Asphalt Company and its pavement in such an unfriendly manner, was inspired by personal animosity, and for this reason one of its three members refused to sign the same. One of the two who did sign it—the chairman of the Board—had only been a member about six months before this report was promulgated. He came into the Board without any previous experience, engineering or otherwise, in public works, or qualifications natural or acquired, to enable him to ever familiarize himself with the work placed under his charge. In the first month of his term he needlessly and voluntarily rushed into personal warfare with the local agent of the Barber Asphalt Company who happened to be city sweeping contractor also, which resulted in a public scandal which was heralded to the world by the city press. From that day to this he has devoted his entire time and brain in an effort to punish this local agent and the company he represents, hence the animus of this report. Very respectfully,

ALEX. MEYER, Wholesale Jeweler.
CONSTANT & SQUIRES, Wholesale Coal Dealers.

Our property is paved on three sides with asphalt pavement and has given entire satisfaction—WOODMAN LINSEED OIL WORKS, F. E. Ritchie, Manager.

Barber asphalt pavement abutting our elevator, and same has given unqualified and entire satisfaction—WOODMAN & RITCHIE CO., by Chas. L. Harris, Sec. and Treas.

ST. A. D. BALCOMBE, Ex Chairman Board of Public Works.
MILTON ROGERS & SONS.
W. G. SHRIVER.
SHRIVER & O'DONOHOE, Real Estate and Loan Brokers.
A. P. HOPKINS, Pres't Commercial National Bank.
ALFRED P. MILLARD, Cash'r Commercial Nat'l Bank.
DEWEY & STONE FURNITURE CO.
WM. S. KIERSTEAD, Ex-Member Board of Public Works.
W. A. PAXTON.

CARE OF ASPHALT PAVEMENTS.

IN an answer to a recent question, asked by a representative of the Youngstown, O., *Telegram*, as to the best method of taking care of an asphalt pavement, Mr. James M. Wright, of the Barber Asphalt Company, said:

"Let it alone more in the daytime. You people here sprinkle your pavements too much. You don't sprinkle it, you slop it. Your carts go along at short intervals, and instead of throwing out a nice settling spray, they fairly drown the pavement with the quantity of water ejected. If, instead of this, you would thoroughly flush the streets every other night, and would once a day, about noon, sprinkle them nicely, you would find them in a much more healthful and cleanly condition. You might say they would be too dusty, under the circumstances, but there are not enough droppings in two days, and enough would not be tracked on, now that so many of your streets are being paved, to create any dust to speak of.

"'Does so much water thrown on during the heat of the day have any effect on the asphalt?'

"Absolutely none. Neither intense heat nor excessive cold, nor any kind of weather, has any effect upon it, whatever. Speaking of the effect of weather upon asphalt, I had Mr. McKeown, the chemist, analyze a piece taken from a part we were repairing a year or so ago, and the analysis proved that its composition was exactly the same as when first placed, and that it had not lost one iota of its strength, purity or elasticity."

DAMAGE TO ASPHALT PAVEMENTS BY WATER.

To the Editor of Paving and Municipal Engineering:

WHILE the writer is a firm believer in asphalt pavements he is ready to admit they are not perfect, and to discuss means of overcoming their few defects. In your September number just received, you quote from the annual report of the Omaha Board of Public Works, in the course of which the statement is made that "water is the mortal foe of asphalt pavements." Water is not only a public comfort but a public necessity, and it will, as it should, continue to be used and will flow on forever, whether asphalt remains in favor or not.

Experience with asphalt pavements as commonly constructed in the east has demonstrated that the charge is not without foundation. Of course it is not admitted, nor is it understood to be claimed by any one that rain or ordinary street sprinkling is injurious to the pavement when it is allowed to become thoroughly dry again soon. The damage is most and soonest apparent where the flow of water is constant for a number of months, as, for example, adjacent to an overflowing drinking fountain, and from there along the gutter to the point of discharge into the sewer. Excessive daily sprinkling without giving the pavement a chance to dry out is injurious to it, and will shorten its life materially in proportion to adverse conditions.

This defect, thus frankly acknowledged, is not a new discovery. The difficulty has long been recognized and various measures have been tried to overcome it, or, at least, to reduce it to the minimum. In some cities ordinances have been passed seeking to regulate the sprinkling of streets, and in many places the gutters are laid with Portland cement, stone flagging or paving blocks, while in others, the asphalt is laid to the curb and a space of 12 to 15 inches along the curb is covered with a thin coating of asphalt cement or coal tar.

Pure asphalt (not accepting Mr. Gibson's definition) is absolutely impervious to water, salt or fresh, and therefore altogether insoluble in it however long the exposure. It is this quality which has made it valuable for lining cisterns, water-works, reservoirs and irrigating ditches; for coating piles and water pipes, and for submerged masonry. The cause of the trouble is not to be found in the asphalt itself, neither is it reasonable to believe that the solids entering into the pavement mixture—sand and limestone dust—contain the elements of destructiveness, although it is unquestionably true that the quality of the mixture would be materially improved if the powdered carbonate of lime should be heated sufficiently to expel from it all the moisture taken up from the atmosphere, instead of adding it cold as is commonly done. There is but one other ingredient in the mixture—the fluxing oil—and here is the source of the trouble.

PAVING AND MUNICIPAL ENGINEERING makes a copious extract from a *Chicago Tribune* interview in which a paving contractor claims superiority for the Trinidad asphalt because of the fact that it has long been exposed to the sun and "has become thoroughly tempered," whatever that may mean. The leading idea in this remark has been expressed by others in a somewhat similar statement that the tropical sun has shone upon the lake for centuries, distilling by slow process all the volatile oils from the asphalt, thus exhausting its effect and leaving a substance which can no longer be affected by the sun of our temperate belt. To those not acquainted with the process of pavement manufacture, this would seem to be a good, sound proposition, and the fair inference would be that any asphalt not exposed to such conditions could not compete for durability with the Trinidad. But since we are searching for the truth, let us look into this matter a little more closely, and, doing so, we find that the distillation process has been carried too far altogether, that the asphalt is entirely too dry and brittle, and that before it will possess any value as a paving cement a restitution must be made of some of the properties taken away by the tropical sun. Something must needs be added to soften the asphalt and give it the requisite elasticity possessed in its antecedent form. The substance in general use for this purpose is the residuum left from refining the petroleum oils of Ohio and Pennsylvania. These still bottoms are what remain after taking out the benzine, gasoline and various grades of burning oils at temperatures increasing up to about 550° F. The base of this residuum is paraffine, a substance so different in most respects from asphalt that when the two are brought together the result is a mixture rather than a combination, and being of different gravities, there is a tendency to separate when allowed to stand for any considerable period without stirring.

The necessity of softening the asphalt for any of the various uses heretofore spoken of, is not confined to that from Pitch Lake; there is none which in its natural state could in any considerable quantity be depended upon as having the exact amount of elasticity to permit of its safe use. An asphalt of excellent quality is found in abundance on the Pacific coast, under conditions almost identical with those at Trinidad, except that the surfaces exposed are not concentrated in one large body or lake, but are found scattered along the coast for many miles, the largest covering a number of acres in extent. Geologically the two products are exactly the same, and their principal characteristics are the same in all respects. In both cases the substance was formed centuries ago by organic decomposition beneath the earth's surface, and while still in liquid state was forced by great pressure to the surface, where, by long exposure to the sun and air, it has, to a certain depth, parted with its most volatile constituents, and become more or less oxygenated. In the California field, liquid asphalt—maltha—still appears at the surface in some localities, showing more recent action, and the same may be found on nearly all the asphalt bearing lands by drilling to the proper depth. Its gravity is from 13° to 16° Beaume. From the earliest use of asphalt on the Pacific coast for paving and other construction purposes, this maltha has been recognized as the proper fluxing substance, and nothing else is known there. Theoretically, there is every reason why it should be exactly suited to the purpose. Being the antecedent form of the asphalt itself, the two must be entirely homogeneous, and when brought together a chemical union takes place with as little effort and as much promptness as could reasonably be expected in view of their gravities. Practically, the results following its use have been entirely satisfactory, and such a thing as injury by water is not known there, either in the case of pavements, piles, water pipes or reservoirs.

This would seem to be conclusive as to the weak point in the eastern pavement, and to indicate the remedy against the most serious cause of complaint. It concerns all who are interested in developing a perfect pavement, taxpayers and municipal authorities, as well as contractors, to study the matter well and apply improved methods wherever experience shows the necessity.

Kansas City, Mo., September 25, 1891. E. G. CHURCH.

ABUSE OF PUBLIC ROADS.

To the Editor of Paving and Municipal Engineering:

SIR—I am particularly interested in improvement of streets and roads and greatly cheapening their cost by improving the conditions of use for a given traffic or tonnage. Economy lies in the direction of cheapening the use of roads by minimizing the abuse of them. In that direction lies also justice. The freedom of public roads should be that of use not abuse. While it might not be advisable, if possible, to tax each user strictly or even approximately, according to the amount of tonnage hauled by him, surely no user or set of users should be allowed to impose any avoidable tax upon others. I mean to say that every man who uses a vehicle having tires of insufficient width is imposing an unnecessary tax upon the community and is defrauding users of economical vehicles of their proper share in public property. It does not perhaps, materially better things to reflect that he taxes himself just a little more heavily than any one else. He has not only to use a damaged road but also to furnish horse-power to do the extra damages and has to repair the corresponding damage to his vehicle. Now heavy vehicles generally have insufficient tire widths, hence owners of light vehicles are, along with the community at large, very unjustly taxed and that without benefit done to any one, *not excepting wagon makers.* J. M. HEISKELL.

Memphis, Tenn., Oct. 2, 1891.

SEWER RATES.

THE Common Council, of Hillsdale, Mich., has passed an ordinance, fixing annual rates for connection of private drains with public sewers as follows:

For bath tubs, one dollar.

Soda fountains, one dollar.

Urinals, one dollar and fifty cents.

Water closets, two dollars.

Sinks, one dollar for the first one and twenty-five cents for each additional one.

Wash bowls, fifty cents.

Water motors, fifty cents.

Special rates for dyers, four dollars.

Special rates for country buildings, fifty dollars.

TESTS OF PAVING BRICK.

The following shows the result of tests made of Syracuse paving brick at Watertown Arsenal, Mass., by W. A. Marye, Lieutenant of Ordnance Department, U. S. A.:

1	Cracked.....	91,000	Crushed.....	29 060,	Per sq.	inch.
2	"	93,400	"	28,530,	" "	"
3	"	119,000	"	20,060,	" "	"
4	"	167,000	"	33,500,	" "	"

The bricks sustained the maximum power of the testing machine. They were broken by numerous cracks, but the ultimate strength they were capable of sustaining was not reached. The capacity of the United States testing machine was 800,000 pounds. Granite of same size as brick cracked 65,800; crushed 12,850 per sq. inch.

ROAD MACHINE CONTEST AT MEXICO, MO.

THE road machine contest held at Mexico, Mo., under the auspices of the State Board of Agriculture, was a decided success, nearly every county in the state being represented by one or more delegates.

Gov. D. R. Francis was present two days, and favored the meeting with a forcible address, in which he gave assurance that he was in hearty accord with the movement for better roads.

All the machines that contested did excellent work. The contest was not arranged with the expectation of demonstrating the great superiority of any one machine, but more especially to advertise the merits of all, and thereby call the attention of the road makers of the west to the great saving of time and money and the resulting improvement in the condition of our roads by their general use.

The points considered in the contest were divided into two classes, to be passed upon by separate committees—first, a mechanical expert committee, who passed upon the points covered in score card "A," and a practical road-makers' committee, who passed upon the points covered in score card "B." In selecting the members of these committees the board of agriculture tried to select men whose position in the scientific and business world would insure confidence in their verdict. The judges to pass upon points in score card "A" were M. L. Holman, C. E., water commissioner, St. Louis, Mo.; Geo. Burnett, C. E., president of the board of public improvements, St. Louis, Mo.; and Hiram Phillips, C. E., of the engineering department, State University, Columbia, Mo. The committee to pass upon points in score card "B" was composed of the following well-known persons: Alfred Devault, member legislature from Montgomery county, chairman of committee on roads; W. T. Heame, member of the state board of agriculture, Independence, Mo.; and J. L. Erwin, Fulton, Mo.

There were five firms represented, entering seven machines, but only six contesting, the "Leader" for some reason being withdrawn.

The machines according to their entrance number, name and manufacture, were: No. 1, "Western Reversible," Western Grader Company, Aurora, Ill.; No. 2, "Light Champion" American Road Machine Company, Kenwelt Square, Pa.; No. 3, "King," manufactured by the same company as the "Light Champion." No. 4, "Fort Wayne Reversible," Fleming Manufacturing Company, Fort Wayne, Ind.; No. 5, "Leader," of the Fleming Manufacturing Company; No. 6, the "Mt. Pleasant Reversible," Mt. Pleasant Road Grader Company, Mt. Pleasant, Iowa; No. 7, the "Austin Reversible," T. C. Austin Manufacturing Company, Chicago, Ill.

The contest was a working trial with the exception of the draft, which, owing to the limited time and the intensity of the heat, and dry weather, was omitted, and for the sake of uniformity, and so as to compare on a scale of 100, all were graded perfect, 20. The records were as follows:

SCORE A.

		No. 1. Western Reversible.	No. 2. Light Champion.	No. 3. King.	No. 4. Fort Wayne.	No. 6. Mt. Pleasant.	No. 7. Austin.
1	General construction	9.0	8.0	7.5	8.0	6.0	8.7
2	Quality and class of material	9.0	9.0	9.0	9.0	9.0	9.0
3	Mechanical proportion of parts	9.0	7.0	7.0	9.0	5.0	9.5
4	Durability	9.0	8.5	8.5	9.0	8.0	8.5
5	Ease of management and adjustment for various kinds of work	9.0	8 0	8.0	9.0	6.0	9.0
6	Acute working angles of blade	9.0	8.0	7.0	10.0	7.0	9.0
7	Position of blade to ground and ability to scour	10.0	10.0	10.0	10.0	10.0	10.0
8	Average distance earth is moved, each successive round, from bottom of ditch to center of road	10.0	10.0	10.0	10.0	10.0	10.0
9	Capacity of machine to build a given amount of road in a given length of time	9.6	9.6	9.8	10.0	9.3	9.0
10	Quickness of action and powera pplied to blade by lever	9.0	7.0	7.5	7.5	6.0	9.0
11	Ease of transportation and housing	10.0	10.0	10.0	10.0	10.0	10.0
12	Best position for operator to view work of blade and team	9.0	6.0	7.5	8.5	9.5	9.7
	Total	111.6	101.9	101.8	110.0	95.7	111.4
	SUMMARY.						
	Durability, on the scale of 16	14.4	13.6	13.6	14.4	12.8	13.6
	Adjustability, on scale of 14	13.0	10.6	11.3	12.5	10.1	13.8
	Simplicity, on a scale of 10	9.8	9.8	9.0	9.8	9.0	9.4
	Total 40	37.2	34.0	33.9	36 7	31.9	36.8

SCORE A.

		No. 1. Western Reversible.	No. 2. Light Champion.	No. 3. King.	No. 4. Fort Wayne.	No. 6. Mt. Pleasant.	No. 7. Austin.
1	Ability of machine to do its own plowing	10.0	8.0	8.0	8.0	7 3	10.0
2	Borrowing from banks outside of wheel	8.6	8 3	8.0	7.7	8 0	10.0
3	Making ditches	10.0	8.3	9.0	10.0	7.7	10.0
4	Filling ditches	10.0	10.0	9.7	10.0	10.0	10.0
5	Moving earth either to right or left, ordinary work	10.0	8 0	9 3	8.0	8.3	10.0
6	Moving earth either to right or left up steep slope	7.7	8.0	9.3	7.7	7.7	8.0
7	Moving earth straight forward down hill	8.6	8.7	8.7	8.3	10.0	8.7
8	Working side hill, borrowing from one side and filing other	9.4	8.0	7.7	7.3	8.0	9.3
9	Behavior when working gravel or stony hills, hard clay, gumbs, or hard packed roads	10.0	8.6	6.3	7.7	6 0	9.7
10	Freedom from choking in high grass, weeds, heavy sod or wet ground	9.6	7.0	8.3	8.0	8.0	9.3
11	Freedom from sliding sideways	8.4	7.7	10.0	7.7	7.3	8.0
12	Widening narrow turnpiked or graded roads	10.0	8.0	8.7	8.6	8.3	10.0
	Total	112.3	97.6	103.0	99.0	96.6	113.0
	SUMMARY.						
	Variety of work, on scale of 10	9.7	9.7	7.7	8.3	8.7	10.0
	Quantity of work on scale of 14	13.3	12.0	11.7	12 0	12.0	14.0
	Quality of work on scale of 16	16.0	13.0	14.6	14.0	12.0	15.0
	Total 40	39.0	34.7	34.0	34.3	32.7	39.0
	Draft on scale of 20	20.0	20.0	20.0	20.0	20.0	20.0

Weights of Machines.—Western Reversible, 2,022 pounds; Light Champion, 2,290 pounds; King, 2,366 pounds; Ft. Wayne Reversible, 2,132 pounds; Mt. Pleasant, 2,022 pounds; Austin Reversible, 2,259 pounds.

A NEW PAVING BRICK.

A WELL-KNOWN citizen is taking pleasure in describing what promises to be the paving brick of the future. He learned recently that a brick invented by a friend in the east, and prepared by chemical means without the use of burning kilns, had stood the test of sixty-eight tons in the New York school of mines. He thereupon sent for the sample, which resembles Philadelphia pressed brick in appearance. The sides are very smooth, but the edges show the grain, and the brick is apparently as hard as granite. It can be made at the price we pay now for home-made building brick, and, what is better, can be made in La Crosse as well as anywhere else.

In a letter the inventor describes the brick as made largely of gravel and sand. The sample sent was made July 15. The brick is ready twenty-four hours after being put into the mold. The mold is the same as is used with our soft clay brick machinery. The sample sent, notwithstanding its hard and finished appearance, was subjected to no pressure. The inventor has been a contractor and builder for twenty-four years. The brick, he says, can be made as hard as steel in twenty-four hours, is impervious to water, and will stand any climate. It is also fire-proof and can be made of any kind of earth. This brick is 8½x2 inches and weighs five and a half pounds.—*The La Crosse (Wis.) Press.*

AN EXPERIENCE IN WATER FILTERING.

A REMARKABLE instance of the value of a special water supply is mentioned by the Sheffield correspondent of *The Engineer*, Mr. G. W. Hawksley, the proprietor of the Belle Isle Dye Works, Wakefield. The water supply cost him about $5,000 a year, and as it was likely to cost him more, he set his wits to work to supply himself from the river Calder. He has put up a large tank, 22 ft. long by 12 ft. deep, to receive the water, which he lifts by a double acting pump from the river. He mixes about 20 per cent. of air with it, and then passes it into the large reservoir, through a series of six filters of steel, 4 ft. in diameter by about 5 ft. high. He filters the water upwards, and passes it under pressure filtered into the large tank at the top. A difficulty was the large amount of wool and dressings from the mills thrown into the river above his works. He was solaced with the assurance that in a very short time the filters would be silted up. To get over this he had the filters arranged with large asbestos-packed plug taps, by which he could reverse the current in any filter, thereby causing the filtered water from the other five filters to wash out the heavy matter that had been absorbed in the filter bed, thus scouring the filtering material with filtered water. As this wool has a very great tendency to felt up the filtering material into balls, he had to find a remedy. He drained the filters of the water, and then charged each with high-pressure steam. When the filters were thoroughly saturated with high-pressure steam, he shut off the supply, and suddenly opened the waste plug tap, by which he got an expansion of steam in all the cocoons of felted matter, which instantly burst, and thus the materials are thoroughly cleansed. By the success of this experiment, Mr. Hawksley estimates his saving at not less than $2,500 a year.

PUBLIC CONTRACTS.

A RATHER interesting point was decided a few days ago in the Supreme Court of Pennsylvania. There is a statute in that state requiring contracts for public work to be awarded to "the lowest responsible bidder." Not long ago, bids were invited by advertisement for certain public work, and, in the advertisement, the right was reserved "to accept or reject all bids, as the best interests of the city may demand." All the bids received were rejected, and another advertisement was made. The lowest responsible bidder under the first advertisement claimed the contract, in accordance with the statute, which says nothing about reserving the right to reject all bids, and makes no exception to the provision that the lowest responsible bidder must be awarded the contract. The question appears to have been whether the first advertisement was an absolute invitation for proposals, such as the statute contemplated, or only a provisional one, conditioned upon the decision of the proper authorities that the bids received under it were such as the best interests of the city demanded. The supreme court upheld the latter view, and decided that no responsibility was incurred to the lowest bidder, under the first advertisement, by rejecting all bids. This is not the first time that the contractors have met with disappointment through too great reliance on their interpretation of the meaning of this particular statute. Some years ago, a large public contract was awarded to a person who was not the lowest bidder. The contractor who made the lowest offer sued to have the contract awarded to him, under the statute. He proved that he had ample capital, and long experience in the business, and claimed that he was the lowest responsible bidder, and was entitled to the work. The defense was that the commissioners who had in charge the matter to which the contract related thought that they had reason to believe that the lowest bidder was intemperate, and that he had been guilty of dishonesty and attempted bribery in connection with another public contract. It was proved that these impressions in regard to the bidder were groundless; but the supreme court held that, if they had been well founded, the commissioners would have been justified in considering that a man who had been guilty of such misdemeanors was not a "responsible bidder" within the meaning of the statute, whatever his financial standing might be; and, while it expressed astonishment that the commissioners should have given credence to such rumors about a man, without ascertaining the truth by inquiry, it held that their discretion was absolute, and that, in the absence of fraud, their decisions were not subject to review by the courts.—*American Architect.*

UNDERDRAINS FOR ROADS.

THE following is an extract from the specifications for the improvement of roads at Lenox, Mass., of which Mr. W. S. Bacot, of New York, is the engineer:

"Underdrains, if found necessary, shall be constructed wherever and whenever the engineer shall decide, at the expense of the contractor, and shall consist, unless otherwise ordered, of the best quality of 3, 4 or 6-inch unglazed earthenware drain pipe laid with open joints with collars, the joints to be loosely filled with such packing as may be directed; to be carefully laid according to a true line and uniform grade furnished by the engineer and indicated by suitable stakes for the purpose. Where soft ground is encountered, not affording a firm bearing for the pipe, a hemlock board 1 inch thick and 6 to 10 inches wide must be laid lengthwise under the same; also thin blocks between the collars to afford a bearing to the pipe. The pipe shall be laid to such depth as may be prescribed in each case by the engineer.

"After the pipe has been properly laid and inspected, the trench shall be filled with cobble-stones carefully packed to a height of at least 18 inches above the top of the pipe, or as may be further directed by the engineer. The surface of the stone is then to be covered with a bed of cut sods not less than 1½ inches thick, rammed to place, above which a filling of dry gravel is to be made to the general level of the road bed, laid in courses not more than 4 inches in thickness. Outlet connections for the drains shall be made according to the directions of the engineer.

"THE GOSPEL OF GOOD ROADS."

UNDER the auspices of the League of American Wheelmen, a series of excellent articles by Mr. Isaac B. Potter, of New York, entitled the "Gospel of Good Roads," have just been published in attractive form. The articles are addressed to the American farmer, for whose direct benefit the information is intended. The title is apt. The gospel of good roads is a kind that can not be preached too much in America. Mr. Potter has presented his information and arguments with remarkable ability—tersely, strikingly and in a way well calculated to have the desired results.

Improvement and Contracting News.

PAVING.

La Salle, Ill., will spend about $30,000 on street paving.

Main street, Rome, Ga., has been graded and macadamized.

Brick paving will be tried on Fifth avenue, at Bay City, Mich.

Providence, R. I., will lay granite block on Dorrance and Cranston streets.

Reidsville, N. C., has awarded a $22,600 paving contract to Lea & Co., of Danville, Va.

The roads leading into New Britain, Conn., are being macadamized by Selectman Bassett.

East and West Main street, from East avenue to Erie canal, Rochester, N. Y., is to be paved with either Medina or granite block.

The contract for paving Central street at Pottsville, Pa., has been awarded to Lewis Grant at $2.96 per square yard for Cape Ann granite.

Broadway, Denver, Colo., is to be improved for a distance of six miles. The material to be used will either be asphalt, stone or vitrified brick.

The property owners on Arch street, Alliance, Ohio, are very much elated over the prospects of having their street macadamized before winter.

Ninety thousand vitrified brick will be used by the street car company, at Harrisburg, Pa., for paving between the car tracks on Race and Vine streets.

The Board of Public Works of St. Paul, awarded the contract for paving West Sixth street from Smith avenue to College avenue, to W. J. Preston, for $3,038.

The city of Hannibal, Mo., will shortly advertise for bids for paving Broadway, about 4,000x70 feet. For particulars, address A. Scheineman or F. R. Rockling.

At Roanoke, Va., the Development Company is grading and macadamizing Palmer avenue from Bowman avenue to the residence of Mr. Killian on Development Hill.

The grading of Pawtucket boulevard, Lowell, Mass., is nearly completed and the paving of Western avenue has been delayed by reason of a lack of curbing stones.

C. W. Hartung was awarded the contract for grading the boulevard at Rochester, N. Y., for $1,381.25. Much of the grading has already been done by the property owners.

The Stone Crushing Co. have entered into a contract to macadamize 500 feet of road from Van Dien avenue, Ridgewood, N. J., east towards Paramus, at a cost of 80 cents per foot.

The block pavement on Meridian street, from New York to Seventh street, and on Delaware from St. Clair to Seventh, Indianapolis, will be repaired. Taylor & Lutes have the contract, Indianapolis, Ind.

The year 1891 has witnessed the accomplishment of much in the way of public improvements for the city of Westchester, N. Y. Forty different projects for public works have been so far advertised and sealed bids opened therefor. Including the seven recently opened, they aggregate a total estimated cost of $47,166.08.

Philadelphia, Pa., has awarded a contract to the Vulcanite Street Paving Company, at $1.40 per square yard, and thirty-seven, cents per square yard for repairs for ten years after the first five years have expired.

The Combs Coal and Lumber Company was awarded the contract for furnishing river sand to be used in laying new pavements at Wilmington, Del., at the rate of $1.20 for 2,500 pounds and about 1,200 loads will be required.

A suggestion has been made by the mayor of New Albany, Ind., that the residence streets to be improved shall be paved with a twenty-four foot roadway, with wider sidewalks and a grass plat between the sidewalks and the road bed.

Broad street, in Trenton, N. J., is to be made a width of 100 feet for a distance of nearly two miles, after which it will doubtless be paved. If so, it will not only make the finest avenue in Trenton, but will be one of the finest in the State of New Jersey.

The Barber Asphalt Paving Company are laying 7,500 square yards of asphalt paving on Broadway, Long Branch, N. J. The superintendent says it is the best road he has ever paved on account of the soil being so firm and its adaptation to sustain the asphalt.

Joseph Moore was awarded a contract by the park board for improving the walks about Washington Arch, New York, at a cost of $6,604.10. The Neuchate Asphalt Company also received a contract for paving the walks in Riverside Park, from seventy-second to seventy-ninth streets at $5,940.

Contracts have been executed for the following named improvements to be made at Westchester, N. Y.: Messrs. Brown & Fleming, to furnish a specified quantity of broken trap block and stone screenings, and Tompkins blue-stone, to the Department of Street Improvements. The amount to be paid for the material is $26,010; Ferdinand Boehmer, Jr., for regulating and paving East 138th street, from Railroad avenue east to Madison avenue bridge, for $9,442.75.

Thomas W. Kinser & Son, of Muncie, Ind., were awarded the contract for paving Wabash avenue, Terre Haute, Ind., at $2.40 per square yard for "Canton Iron Paver" brick; five inch limestone curbing, eighty cents per foot. The contract for paving Sixth street was also awarded to the same contractor for $2.15 per square yard for paving, seventy cents per foot for four-inch limestone curb, seventy-five cents per foot for the Parkhurst combined curb and gutter. These prices include Murphy's patent grout for binder and filler.

SEWERS.

Lorain, Ohio, is to have a new system of sewerage.

Summit, N. J., is considering an expenditure of $50,000 for sewerage.

Revere, Mass., is contemplating a system of sewerage for that place to cost $75,000.

The necessity for building a sewer through Walworth run, Cleveland, Ohio, is again being agitated. The cost of this sewer system would approximate $1,000,000.

A system of sewerage has been projected for Golden, Col., and will soon be put in operation.

The pipe for the Walnut street sewer at Green Bay, Wis., has arrived and is being laid.

New sewers are to be constructed on three more of the principal streets of Fond du Lac, Wis.

The question of constructing a sewerage system for the town of Hancock, Mich., is being agitated.

John R. Lee has a $200,000 contract to build the largest sewer ever constructed at Paterson, N. J.

A proposed expenditure of $60,000 for sewer improvements is being considered at Lansingburgh, N. Y.

A trunk sewer to cost $24,000 is to be built at Fair Haven, Wash. It will be made of brick, 4x6 feet.

A $8,970 contract for the construction of a sewer at Superior, Wis., has been let to Messrs. Kirkland & Starkey.

The City Clerk of Quincy, Mass., will give details of proposed expenditure of $400,000 for a complete system of sewerage to be paid for by bonds.

Ham & Carter were awarded the contract for furnishing 300,000 brick to improve sewers at Boston, Mass.

North Baltimore, Ohio, has awarded the contract for the construction of sewers, to Frank Gebert, of Fostoria, Ohio.

Sealed proposals will be received by Wm. Gollings, at Beltzhoover, Pa., for 800 feet of 24 and 30-inch sewer pipe.

Plans have been prepared for a system of sewerage for Woodland, Cal., by A. R. Wilson and T. H. Reed, of Oakland.

The Lewis and Mercer Construction Co. has made a proposition to build sewers on the franchise plan at Columbia, S. C.

According to the plans of Ellis & Allen, the contemplated sewer system for Amesbury, Mass., will cost about $80,000.

The Grand Ledge, Mich., Sewer Pipe Company has just completed four new kilns in addition to those built a year ago.

The citizens of Meriden, Conn., have voted for a sewer system to cost the city $750,000 and valuable contracts will shortly be let.

An expenditure of $12,000 is to be involved in the extension of the sewerage system twelve blocks north at Colorado Springs, Col.

New Haven, Conn., will extend the Canal street sewer and build new ones on Shelton avenue, Oak street, Mill River street and Ash Run street.

Matt Swaugh was let the contract for the construction of a three and one-half-foot brick sewer from Grove street to Park street, at Westerville, Ohio.

The Portsmouth Sewerage Company, with E. C. Marshall, president, and R. L. Herbert, secretary, will build a system of sewerage for Portsmouth, Va.

The Dayton & Cleveland avenue sewer, St. Paul, Minn., to cost $5,172, and the Winston avenue sewer, to cost $1,889, are to be constructed by Wm. J. Preston.

The plans for the Blacksnake sewer at St. Joseph, Mo., calls for 3,000,000 brick; the average price paid is $6.25 per thousand. The work is rapidly progressing.

The City Street Improvement Company was awarded the contract for building the five sections of the Brannan street sewer at San Francisco, Cal. The work will cost over $60,000.

The board of public works let to Brennen & Barrett the contract to build a sewer in the alley from Sixth to Eighth streets between Fatherland and Russell streets at Nashville, Tenn.

The Columbus Sewerage and Drainage Company, incorporated with $5,000 capital stock, will construct sewers, maintain and keep the same in repair throughout the city of Columbus, Neb.

S. J. Perry & Co., of West Bay City, Mich., have been awarded the contract for the Twelfth street brick sewer at Bay City. Said sewer will run from Lincoln avenue to Trumbull street.

The contract for the sewer pipe to be used at Seattle, Wash., has been awarded to the Puget Sound Fire Clay Company, and to the Sidney Manufacturing Company, for pipe up to twelve inches.

D. Mills was awarded the contract for the new sewers ordered for Miller, Bridge, Pearl and Hotchkiss streets, and Goodyear avenue at Hartford, Conn. The tile to be used will be brought from Akron, Ohio.

Messrs. Fishel & Landis, contractors, have placed a number of men at work upon the new extension of the North Duke street sewer, at York, Pa., which is being built of brick and is four feet in diameter.

An eighteen inch sewer is being built in the west side of Market street from the court-house to sixteenth street, Wellington, Del. C. R. Weaver has the contract. The street will be paved after the sewer is completed.

The park and boulevard commissioners, Detroit, Mich., have awarded contracts for building 6,400 feet of sewer for draining the boulevard. Liphardt & Winterhalter get 5,400 feet at 68 cents a foot, and W. H. Handerson 1,000 feet at 58 cents.

Work on the Jefferson street sewer, from Tenth avenue to Thirteenth street, Topeka, Kan., a distance of three blocks, is progressing famously. A force of 128 men is engaged on the sewer in all stages of its completion and commencement.

The policy of providing for the payment of local improvements as fast as completed is a wise one, and Bay City, Mich., will save $1,000 on the extension of the Twelfth street sewer from Lincoln avenue to Trumbull street, by adhering to this policy.

Work is progressing nicely on the six-foot brick sewer, extending from Fourteenth street out Main street a distance of 360 feet, and material is on the ground for constructing the 175-foot sewer to be built to connect with the Johnson street sewer at Keokuk, Iowa.

Sealed proposals will be received at the office of the board of administration, Cincinnati, until 12 o'clock, noon, of Thursday, October 29, for the improvement of Gilvert avenue from Foraker avenue to the trunk sewer in Billings street, by constructing sewers and drains with the necessary appurtenances, according to the plans on file in the office of the chief engineer of the board of administration.

A new sewer is to be constructed in Washington street, Brookline, Mass. Thos. J. Kelley was awarded the contract. Contracts were also awarded to James Driscoll & Sons for the building of new sewers in Prospect avenue, Babcock, Perry and Pleasant streets, and Upland road.

The following sewer contracts have been awarded at Spokane, Wash.: Lincoln street, J. Nan Kervis; Howard and First streets, A. R. Jones, Sprague street, Thos Oleson; Mill street, J. R. Clark. The contracts for vitrified sewer pipe were let to the Washington Pottery Company.

Sealed proposals will be received at the office of the city clerk until 12 o'clock, noon, on Tuesday, October 20, for furnishing the materials and performing the labor in the construction of a twelve-inch tile sewer in the city of Mt. Vernon, O., commencing at the intersection of Maine street with Wooster street and Wooster avenue, and running north on Mansfield avenue.

WATER-WORKS.

Tiffin, O., will have a system of water-works.

New Berne, N. C., is to have a system of water-works.

Tekoa, Wash., is to have a system of water-works.

Blossburg, Pa., is to have a system of water-works.

Water-works are again talked of for Princeton, Ky.

Luverne, Minn., is putting in a system of water-works.

Arcade, N. Y., is considering a proposed system of water-works.

The laying of water pipes at Noblesville, Ind., will soon be commenced.

Cheyenne, Wyo., is extending its water system. Three miles of pipe will be laid.

Bonds to the amount of $60,000 have been voted for water-works at Snohomish, Wash.

S. V. Salem & Co. were granted a franchise to construct water-works at Vermillion, S. D.

Jackson, Mich., is going to expend $100,000 in improving and extending her water system.

The board of trustees of Colton, Cal., is discussing the propriety of a public system of water works.

The question of improving and enlarging the water supply at Santa Rosa, Cal., is under discussion.

A water-works company has been organized at North Baltimore, Ohio, with a capital stock of $100,000.

The Water Works Company at Luling, Tex., are extending their mains to the western limits of the town.

The Mifflintown Water Company has been incorporated with a capital stock of $30,000 at Mifflintown, Pa.

A company with a capital stock of $12,500 has been organized for constructing a system of water works for Gilman, Wash.

A special election will be held to decide the question of bonding the city of Tama, Iowa, for $15,000 for the purpose of putting in a system of water-works.

A $10,000 system of water-works for protection against fire is being placed in the car works at Jeffersonville, Ind.

In November work will commence on the construction of a $90,000 system of water-works for South Bend, Wash.

The village council of Toledo, Ohio, is negotiating with a syndicate for the construction of a system of water-works.

C. E. Kurtz, of Goshen, Ind., has secured the contract for putting in a water-works system at Nappanee at a cost of $9,500.

The Lansing Iron and Engine Works received the contract for putting in a system of water-works at Nashville, Mich.

E. T. Sykes, of Minneapolis, has received an $18,586.20 contract for constructing a water-works plant at Tomahawk, Wis.

The new 2,000,000-gallon high service reservoir at Concord, N. H., will be built by G. W. Hendricks, Easthampton, Mass.

South Haven, Mich., has voted favoring the proposed issuance of bonds to the amount of $35,000 to secure water-works.

Manchester, Va., will shortly issue bonds to the amount of $73,000, to pay for a complete system of water-works for that place.

J. A. Geary and J. F. Roche, of Lexington, have received a contract for building a system of water works at Harrodsburg, Ky.

The city of Woodland, Cal., has voted for bonds for $30,000 for a municipal building, $45,000 for sewers and $55,000 for water-works.

A committee has been appointed to contract with a company on the franchise plan for a system of water-works for Farmington, Me.

The question of piping water from a spring in Wordsworth canon to Alpine, Utah, for a system of water-works, is being discussed.

Blue Springs, Neb, is to have a system of water-works constructed by Shepard & Co., of Beatrice, for $8,600. It is to be a stand-pipe system.

Colfax, Washington, will have a water system which will give a force of about fifty pounds to the square inch on the mains in the city.

Engineer Blake, of New Britain, Conn., has prepared plans at an estimated cost of $80,000 for improvement of the water-works at that place.

George Chambers was awarded the contract for the extension of the Hollwy water main on West avenue, at Rochester, N. Y. His bid was $8,424.40.

Messrs. Holley, Mason, Marks & Co. were given the contract for furnishing the water system, at Spokane, Wash., with 300 tons of pipe, at $18.90.

James H. Christopher has been authorized to construct, maintain and operate water-works at Warrensburg, Mo., for the purpose of fire protection.

Bids will be opened October 19 for the completion of a system of water-works for Fort Worth, Texas; the sum of at least $500,000 will be expended upon the work, and $1,000,000 will be issued for this purpose.

Provo, Utah, is to have a complete system of water-works. Rhodes & Brothers, of Denver, have the contract to put in an underground gallery system at a cost of $12,000, to be paid in city bonds drawing seven per cent. interest.

A contract has been executed with Hartford, Herbert & Co., of Chattanooga, Tenn., for the erection of water-works at Gainesville, Fla.; consideration, $49,479.

The California Wind Mill Company will lay about 6,000 feet of mains, put in hydrants and the entire underground part of the water-works system at Plano, Ill.

Palouse City, Wash., is to have a new system of water-works. The Washington Pottery Company, of Spokane, has been awarded the contract for supplying the pipe for same.

The Ohio Water-Works Company has been organized at Mansfield, Ohio, for the purpose of supplying the inland towns from Sandusky to the Ohio river, with Lake Erie water.

Excelsior, Minn., has voted for a system of water-works. The supply will be obtained from Lake Minnetonka, and will probably be pumped to a reservoir. Estimated cost, $20,000.

The Home General Construction Company has been incorporated at Wheeling, W. Va., with a capital stock of $500,000, for the construction of water-works, etc. Alfred Paull is president.

W. S. Coon & Son, of Upper Sandusky, and the North Baltimore Construction Company will build a system of water-works for North Baltimore. The gang well plan has been adopted and a couple of wells have already been drilled as a test.

Winnebago City, Minn., is to have a complete system of water-works, to be constructed by the Smedly Manufacturing Company, of Dubuque, Iowa. The works will comprise fire hydrants, public drinking fountains, watering troughs and a little over two miles of mains. The expense of the plant is to be a trifle over $10,000.

Bids will be received until October 20 for material and labor for water-works for Eagle Pass, Tex., as follows: Two 500,000-gallon Worthington pumps, two fifty-horse power steel boilers, feed pumps, 16-100 feet stand-pipe, about five miles 10 to 2½ inch cast iron pipe, and twenty-five Ludlow hydrants. C. R. Prouty is mayor.

BRIDGES.

Debeque, Col., is to construct a new bridge across Roan creek at that place.

A new steel bridge is to be erected over White creek, at the Weddle Ferry, Seymour, Ind.

The Northern Pacific is going to build a bridge over the Yellowstone river at Bismarck, N. D.

George H. Craf & Co., of New York, has the contract for the Magnolia street bridge, at Atlanta, Ga.

An iron bridge to cost $6,000 will be built across Clinton river, at Mount Clemens, Mich.

A new bridge is to be built at the intersection of Collingwood avenue and Onecta street, Duluth, Minn.

Preparations are being made for the construction of a bridge across Salt creek, two miles north of Runge, Tex.

Bonner's Ferry, Wash., is agitating the question of building a $20,000 bridge across the Kootenai at that place.

The Parkersburg Bridge Company will build a bridge across the Little Kanawaha river at Parkersburg, W. Va.

Work will soon commence on the Central avenue bridge at West Duluth, Minn., for which P. McDonald has the contract.

The contract has been signed for the construction of the Forsyth street bridge at Atlanta, Ga., total cost being $15,953.75.

Plans have been prepared for a two-span highway bridge across the Potomac, to connect Piedmont, W. Va., and Westernport, Md.

G. W. Jones, city engineer, will give instruction regarding proposed bridges at Pine and Washington streets, at Jamestown, N. Y.

The Wrought Iron Bridge Company, of Canton, O., has been awarded the contract for the construction of an $8,000 iron bridge at Faris' Crossing, Moundsville, W. Va.

Rock River, at Rockford, Ill., will be spanned by a bridge at the foot of Fifteenth avenue, and connecting East and West Rockford. The proposed cost is $15,000.

A new iron and steel bridge is to be erected across the French Broad river, at Leadville, Tenn. The structure will cost about $57,000 and will be 640 feet in length.

The construction of the state bridge across Hunter creek, near Aspen, Col., has been let to the King Iron Bridge and Manufacturing Company, of Cleveland, O., for $11,400.

The question of rebuilding the La Fayette avenue bridge and repairing the Howard, Twelfth, Fifteenth and Baker street structures, at Detroit, Mich., is being agitated.

Capt. Marriott is preparing plans for the erection of an iron or steel bridge over the gully on Fourteenth street, between Thirteenth and Fifteenth, at East Oakland, Cal. The estimated cost is $20,000.

A new bridge is to be built across the Elkhart river, on the Millersburgh and Benton road, the county commissioners having decided to grant the petition. It will cost about $2,000 and be ninety feet long.

John B. Howard, clerk of Holly Springs, Miss., has been authorized to advertise for bids for building a pile bridge across the Tippah at Callahan's old mill on Cornersville and Holly Spring road. The bridge is to be about 300 feet long.

The Board of Freeholders have decided to build a stone arch bridge over the Raritan river at Albany street, New Brunswick, N. J. The bridge is to cost not more than $100,000, and bonds will be issued to provide for its construction.

The Watertown & Northern R. R. will construct a bridge across the Salmon river near Pulaski, N. Y., and another across Black river at Brownville. J. R. Birdlebough, superintendent of bridges at Cortland, N. Y., has charge of the matter.

Sealed proposals will be received at the office of the auditor of Warrick county, in Booneville, Indiana, until 1 o'clock P. M., on Saturday, October 31, for the construction of a wrought iron bridge over Pigeon Creek, in Greer township. The bridge will consist of one spann 80 feet in length and 14 feet in width, resting on iron columns. A. W. Heim is county auditor.

Sealed proposals will be received for the construction of two combination or iron bridges, one thirty foot span with eighteen foot roadway across the Sioux river, one sixty foot span with sixteen foot roadway across Skunk creek, at Sioux Falls, S. D Also the removal of one eighty foot span combination bridge from the Sioux river and placed on Skunk creek on iron cylinders. The distance to be moved is about two miles.

STREET LIGHTING.

Will Hackett will put in an electric light plant at Circleville, O.

The work of establishing an electric light plant at De Kalb, Ill., is well under way.

A contract has been closed to have the streets of Pontiac, Mich., lighted by electricity.

An electric light company has been organized at La Junta, Colo., with a capital stock of $15,000.

The National Electric Light Company of Wisconsin will put in a plant for lighting Chester, S. C.

F. W. Wagner is organizing a stock company to erect an electric light plant at Summerville, S. C.

Little Falls, N. Y., has voted to light the streets by electricity at a cost not exceeding $10,000 per year.

An electric light and power company has been incorporated at Sharon, Pa., with $30,000 capital stock.

An electric light plant with 120 arc lights is to be established at Peabody, Mass., at an estimated cost of $75,000.

The city council of Salt Lake, Utah, has been petitioned for a twenty-year franchise to put in an electric light plant.

A committee has been appointed to select an electric light system for the town of Pascoag, R. I., cost not to exceed $10,000.

The city council has entered into a contract with the Thompson-Houston Electric Company to put in a plant at Marshall, Ind.

An electric light company has been organized with a capital stock of $15,000, and a large plant will soon be erected at Bedford, Ohio.

The contract for lighting the city of Wilmington, Del., by electricity for five years, has been let to the Wilmington City Electric Company.

The principal streets of Franklyn Falls, N. H., are to be lighted with arc lights for five years, by the Franklyn Gas and Electric Light Company.

Erection of new buildings for the South Bend Electric Light plant has been begun by D. Werst & Son, at South Bend, Ind., estimated cost of same being $8,900.

The Leslie Electric Light and Power Company will incorporate with a capital stock of $10,000 for the purpose of lighting Leslie, Mich., by electricity.

An electric light company has been formed with $15,000 capital stock, at West Union, Iowa, to be known as the West Union Electric Light and Power Company.

The Chicago Electric Wire Company, with $1,000,000 capital stock, has incorporated and steps will at once be taken to erect the plant in East Chicago, the company having heretofore operated in Wilmington, Del.

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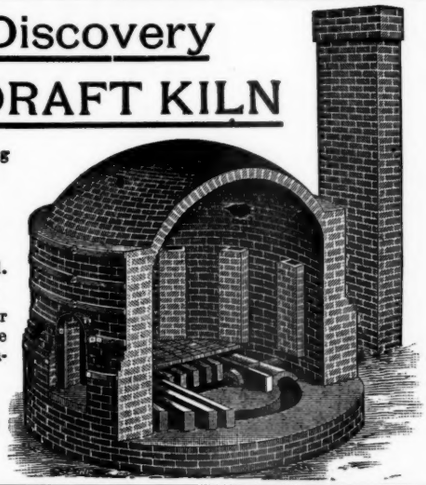

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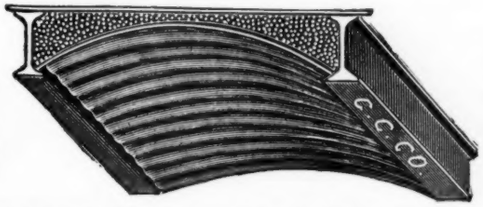

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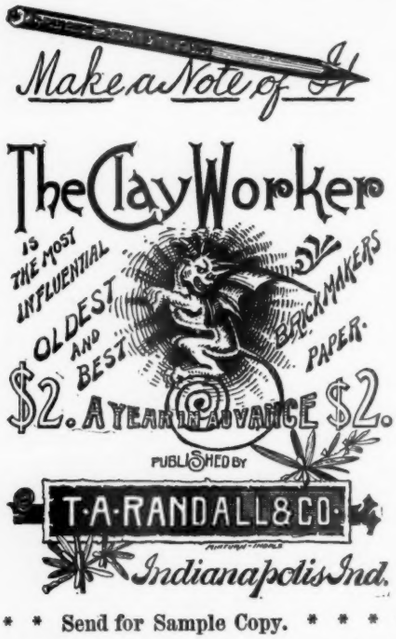

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SEALED PROPOSALS.

SEWERS

Sealed proposals will be received by the Highway and Sewer Committee of the councils of the City of Williamsport, Pa., until 12 o'clock noon, Thursday, October 15, 1891, for the construction of approximately 17,500 feet of pipe sewers from 8 inches to 24 inches diameter, and 700 feet of circular brick sewers, double ring, 30 inches and 36 inches in diameter, in accordance with plans and specifications on file in the City Engineer's office. A certified check, payable to the City of Williamsport, for ten per centum of the amount or amounts bid must accompany each proposal, said sum to be forfeited to the city in case the successful bidder shall fail to execute the contract or contracts for the construction of the work. The city reserves the right to reject any or all bids.

J. J. GALBRAITH, City Clerk.

H. C. REEDER, City Engineer.
Williamsport, Pa., Sept. 29, 1891.

HIGHWAY.

Sealed estimates for regulating, grading and paving with macadam pavement the Jericho road from the Hempstead and Jamaica plank road in the town of Jamaica, to the easterly line of the town of Flushing, Queens county; and also for regulating, grading and paving with macadam pavement the Jericho road from the easterly line of the town of Flushing to the Locust Valley branch of the Long Island Railroad, in the town of North Hempstead, Queens county, will be received by the Board of Supervisors of Queens county on Tuesday, the 20th day of October, 1891, at the Queens County Court House, in Long Island City, at 11 o'clock A. M. of said day.

All estimates for either of the above pieces of work shall be accompanied by the written consent of two or more parties to the effect that should the contract be awarded to the party making the estimate, they will become sureties for him in the amount of $12,500 for Section One, and $12,500 for Section Two.

All estimates for either section shall be accompanied by a certified check in the amount of $2,500, drawn to the order of Robert Seabury, Clerk of the Board of Supervisors of Queens county.

Plans and profiles, contracts and specifications, may be obtained from the clerk of the Board of Supervisors, or at the offices of the engineers, Singleton L. Mitchell, Manhasset, Queens county, and Thomas V. Smith, Hempstead, Queens county.

Dated September 30, 1891.

ROBERT SEABURY,
Clerk of the Board of Supervisors, Queens County, Hempstead, N. Y.

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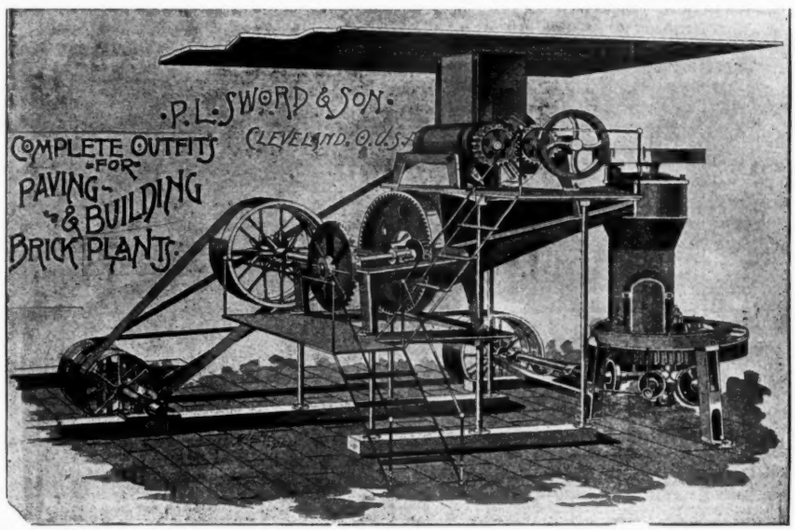

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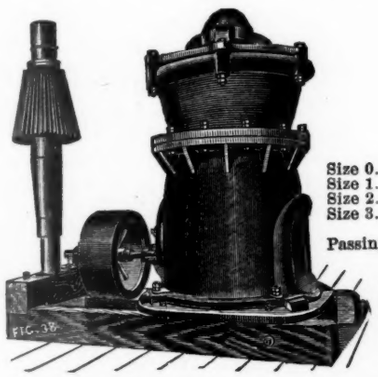

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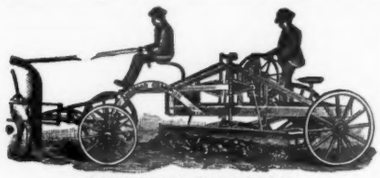

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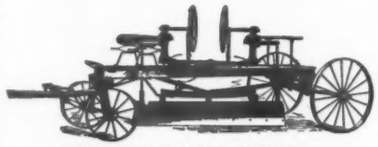

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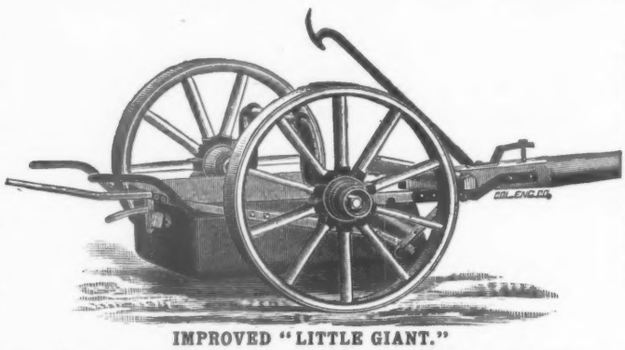

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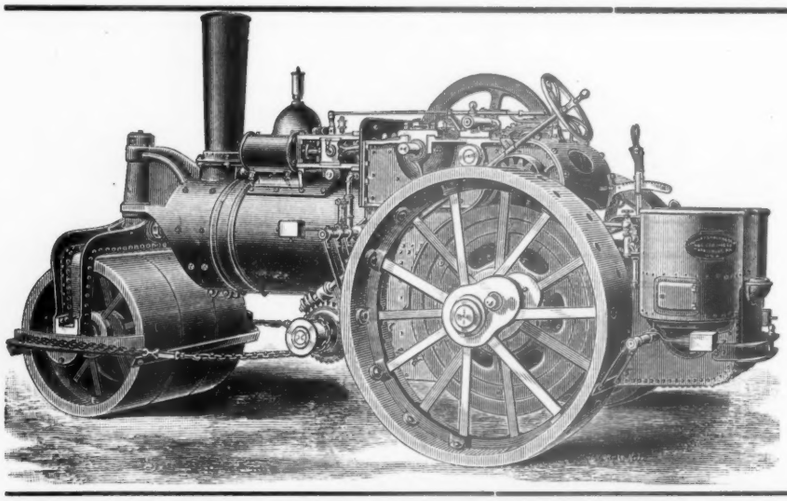

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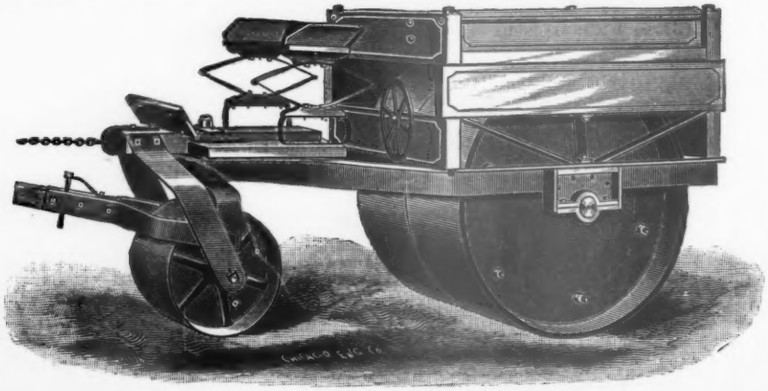

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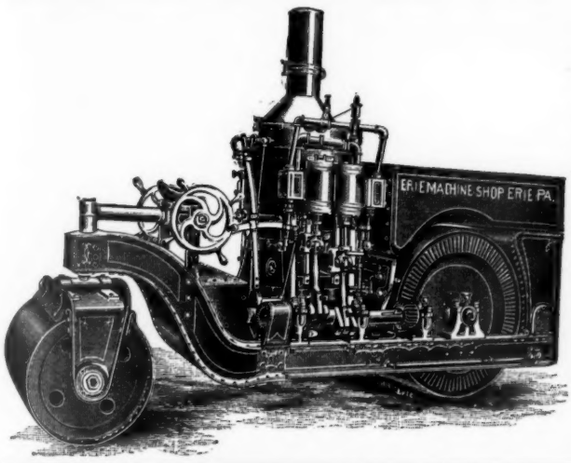

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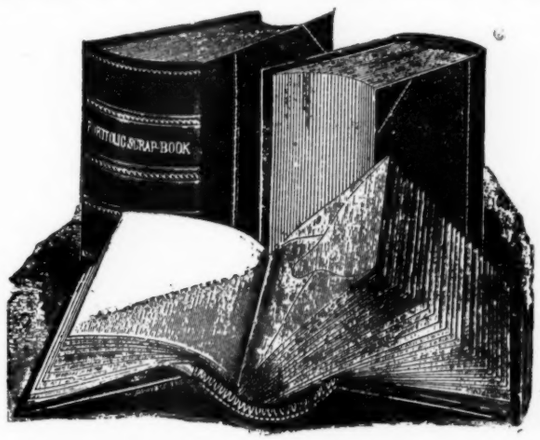

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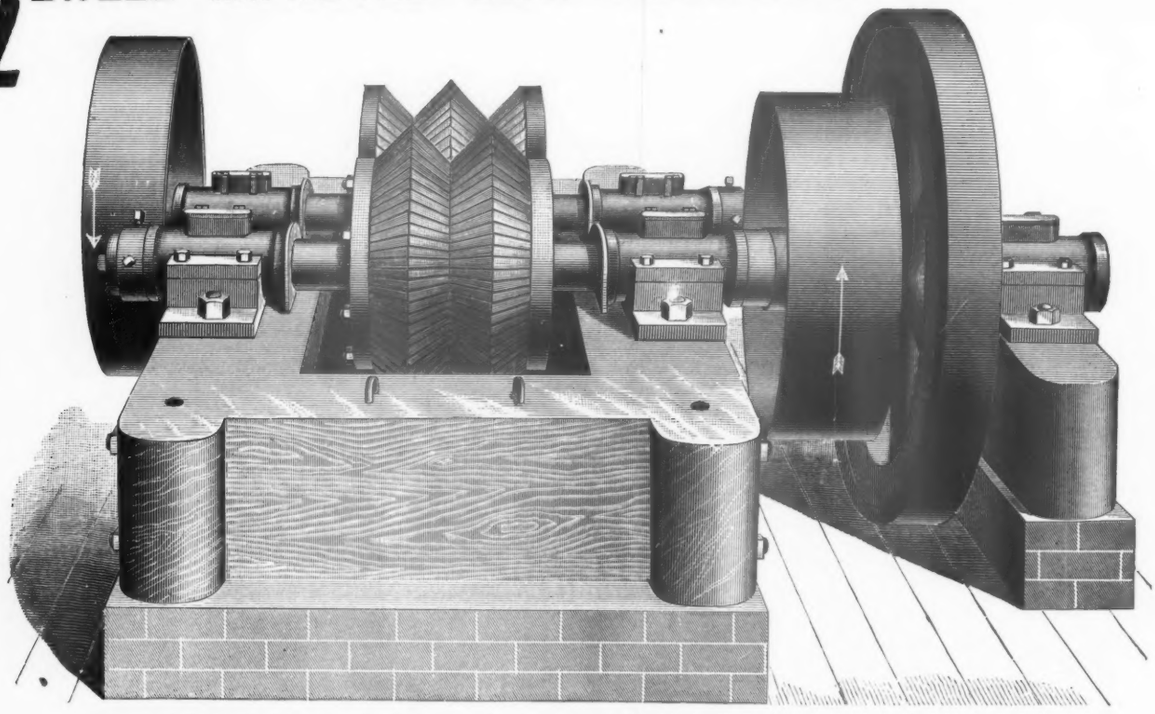

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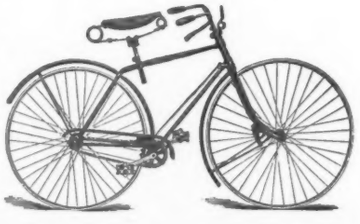

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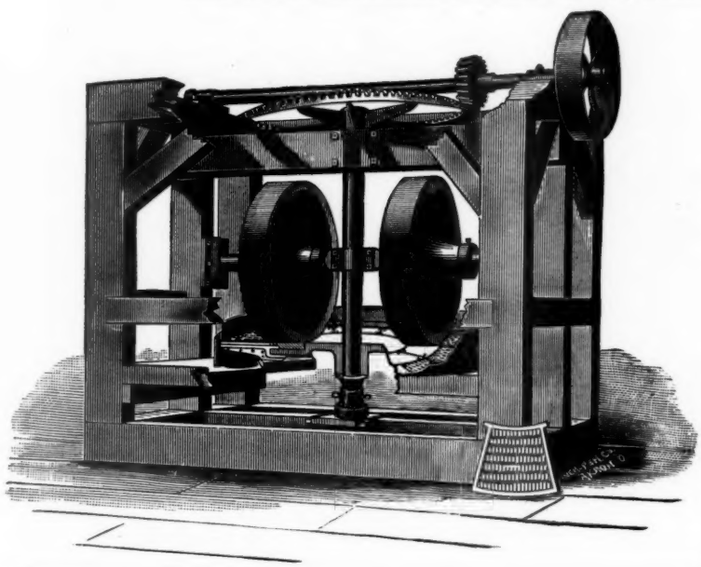

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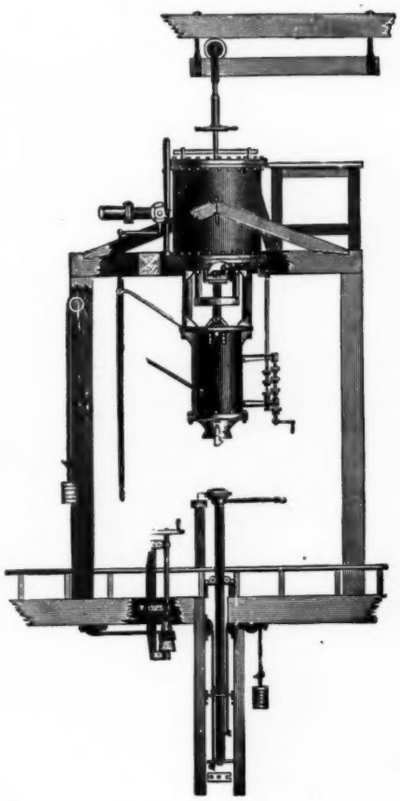

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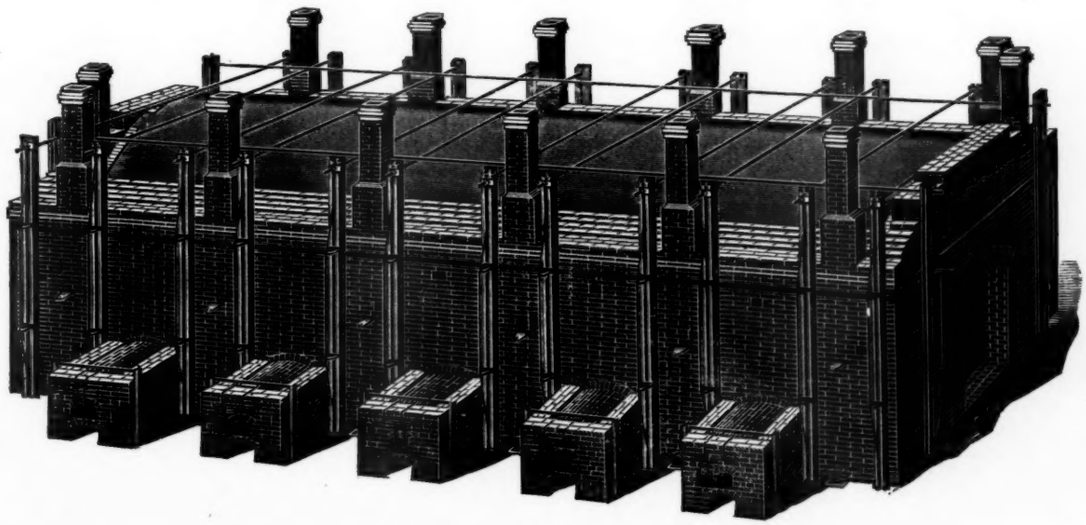

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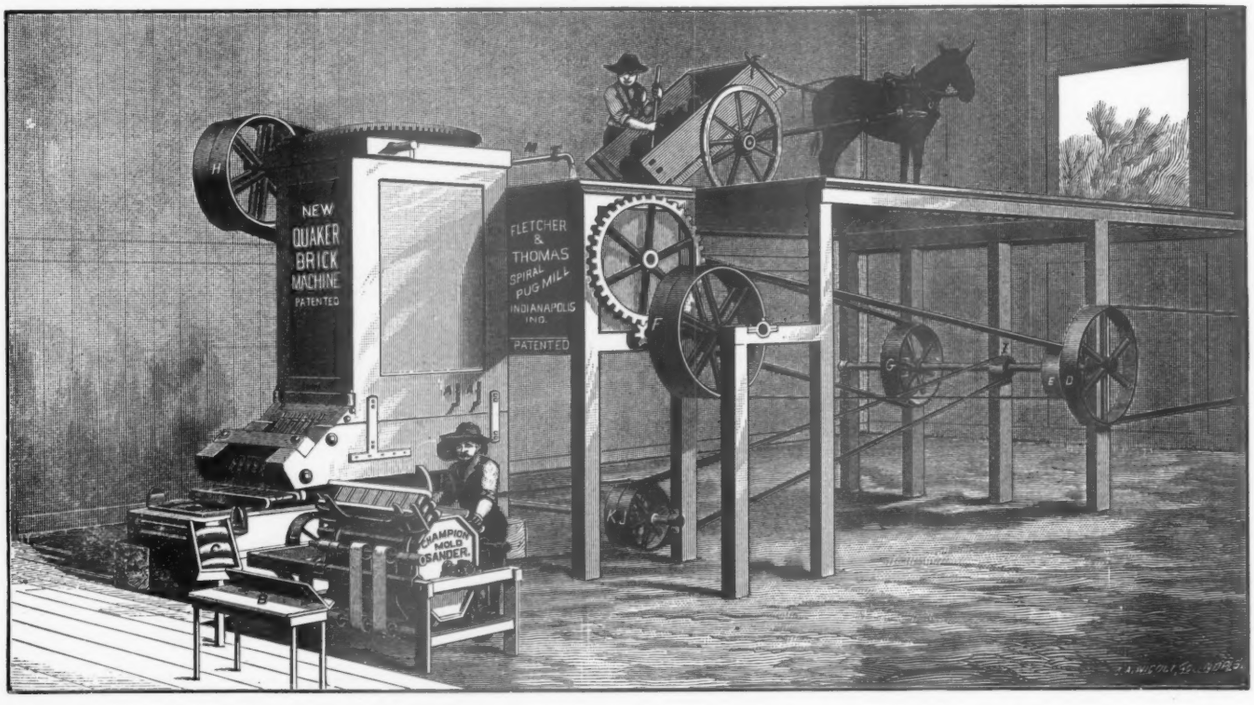

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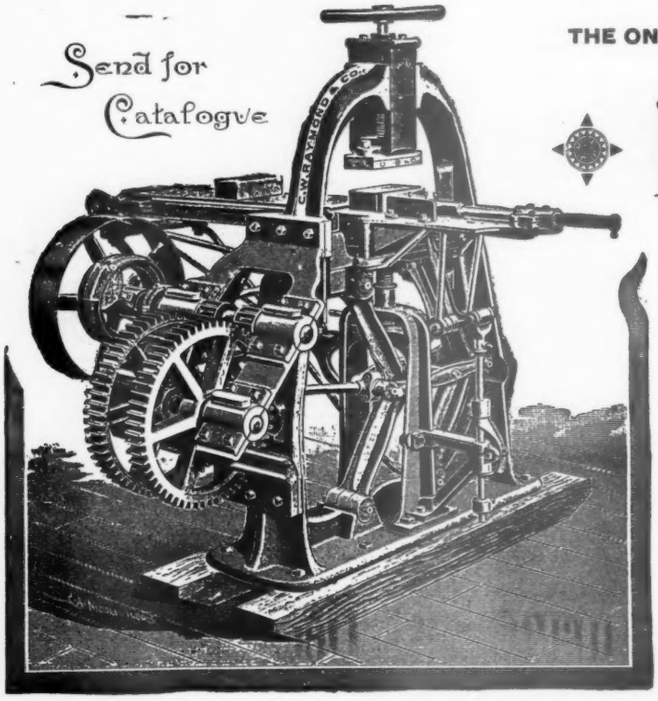

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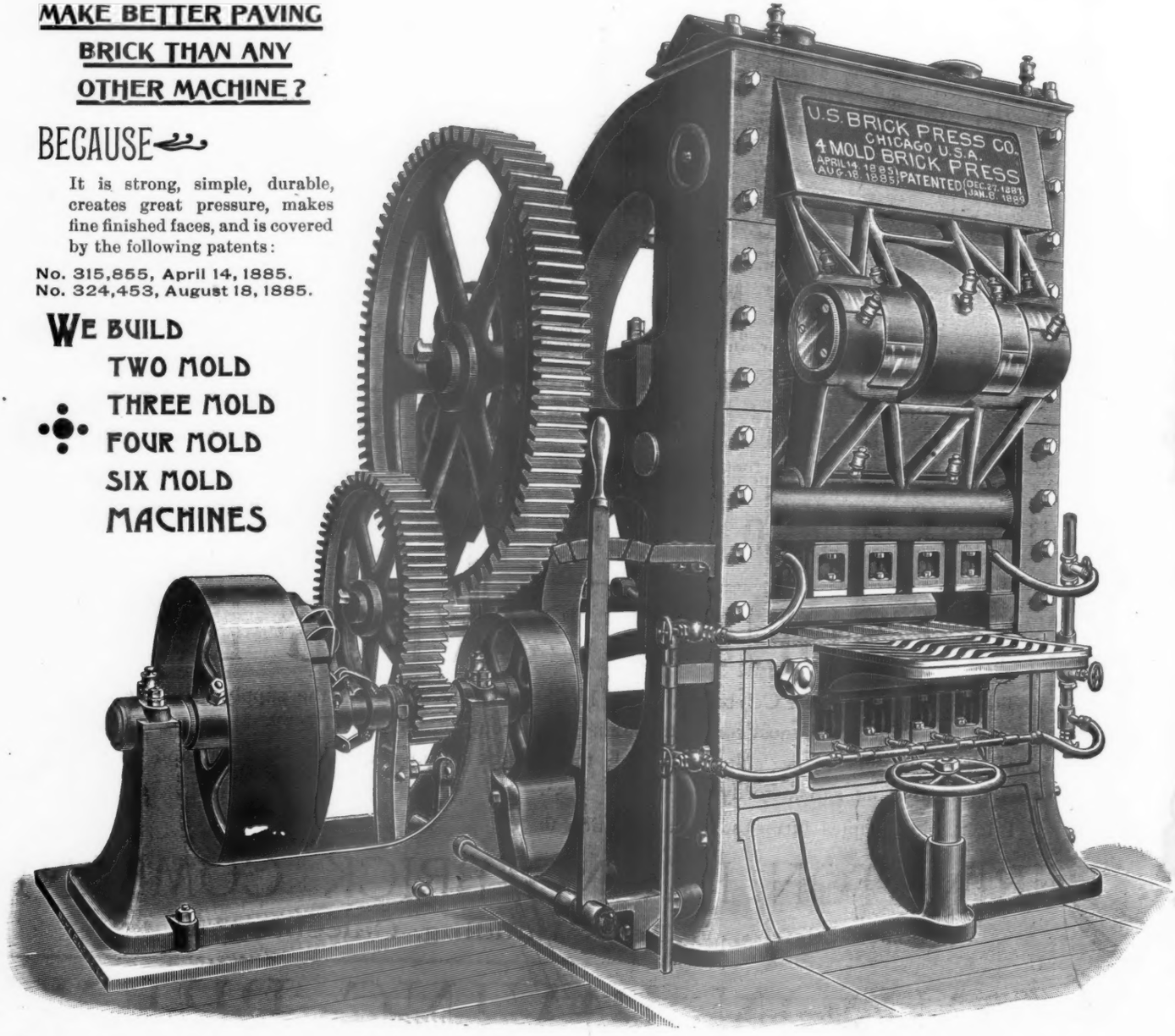
MAKE BETTER PAVING BRICK THAN ANY OTHER MACHINE?

BECAUSE

It is strong, simple, durable, creates great pressure, makes fine finished faces, and is covered by the following patents:

No. 315,855, April 14, 1885.
No. 324,453, August 18, 1885.

WE BUILD
TWO MOLD
THREE MOLD
FOUR MOLD
SIX MOLD
MACHINES



Clay sent us, freight prepaid, will receive our prompt attention, pressed and burned, and sample brick returned.

SEND FOR CATALOGUE AND PRICES TO

THE UNITED STATES BRICK PRESS COMPANY,

OSWALD KUTSCHE, PROPRIETOR.

ADAMS EXPRESS BUILDING, 185 DEARBORN STREET,

CHICAGO, ILL.

CALIFORNIA ASPHALT

THE STANDARD ASPHALT COMPANY, of Bakersfield, Kern Co., California, controlling extensive deposits of genuine asphaltum, believed to be second only to the Trinidad in extent, invite orders for high grade refined asphalt for street paving and other purposes. The supply being practically unlimited, there is no ground for fear that the large and increasing demand can not be met for many generations, notwithstanding those who control the imported article give currency to the idea that there is none in the United States. Our asphalt is fluxed, softened and refined with a natural maltha (liquid asphalt) of 10° to 14° Baumé, forming a chemical and homogeneous mixture superior to the residuums elsewhere used. We can furnish fluxing maltha with our asphalt for the manufacture of paving cement, when desired. We also manufacture the Standard Asphalt Roofing Compound, covered by U. S. and foreign letters patent, flexible, elastic and durable, confidently asserted to be superior to any asphalt pitch or tar roofing ever used. The Standard Asphalt is likewise adapted to and used for pipe covering, electric conduits, reservoir linings, varnishes, etc.

Correspondence solicited and samples mailed to any address upon application. Car load delivery quoted to any point.

STANDARD ASPHALT CO.
Bakersfield, Kern Co., Cal.

E. G. CHURCH,
General Eastern Agent,
Builders' and Traders' Exchange, Kansas City, Mo.

THE WESTERN
Paving & Supply Company

CONTRACTORS FOR

TRINIDAD ASPHALT PAVEMENTS,

THE STANDARD PAVEMENT OF AMERICA.

Over five million square yards in use in the United States.

It has, in fifteen years, raised the streets of Washington and Buffalo from the poorest to the best in the United States.

It will raise the streets of any city that uses it to the same high grade.

It is the only pavement that will do it.

It is the only perfect sanitary pavement.

It enhances the value of abutting property as much as it improves the city using it.

It is the ideal pavement of modern times.

We invite an inspection of our work.

GENERAL OFFICES, 36 LaSalle Street, CHICAGO.
INDIANAPOLIS OFFICE, 33 Ingalls' Block.
DETROIT OFFICE, Cor. Jefferson Avenue and Griswold Street.

CHAS. W. SAACKE,

Importer · of · Rock · Asphalt,

—DEALER IN—

PAVING MATERIALS.

SOLE AGENT FOR

The German Asphalt Co., Mines at LIMMER and VORWOHLE; H. & A. B. Aveline & Co., Catania, Sicily.

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Agents for Different States or Cities Solicited.

California Asphalt

The Oil Burning and Supply Company furnish the finest and purest grades of Refined California Asphalts for Paving, Roofing, Paints, Varnishes, Electrical Works, etc. Our Liquid Asphalt for Fluxing and Tempering is the finest article in the market. We recommend our A G Brand for Paving, 85 per cent. to 90 per cent. pure. Contractors and Dealers supplied in quantities to suit on short notice. Samples on application. Address

The Oil Burning and Supply Company,

8 and 9 BURDICK BLOCK, LOS ANGELES, CAL.

THE BEST PAVING MATERIAL

While Paris, London and Berlin are putting down miles of wood pavement yearly, having proven it the best and most economical, though costing much more there than here, some cities in our own country profiting by their experience are doing the same, as ten miles of our *sapless cylindrical paving blocks* will be laid in Michigan and Indiana during the season of 1891, making an ideal roadway at a low cost. Our second quality blocks make the cheapest crosswalks and warehouse floors and paving for private alleys. Cities desiring the best paving material—dollar for dollar—in the world, should not fail to investigate the merits of our product.

ROSS SAPLESS BLOCK PAVING COMPANY,

SAGINAW, E. S., MICHIGAN.

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Wood Pavement Co.

MOBILE, ALA.

OWNERS OF THE PATENT RIGHTS FOR MANUFACTURING THE CYLINDER SAPLESS

WOOD PAVING BLOCKS

FOR THE STATE OF ALABAMA, AND FOR MAKING AND LAYING

—THE—

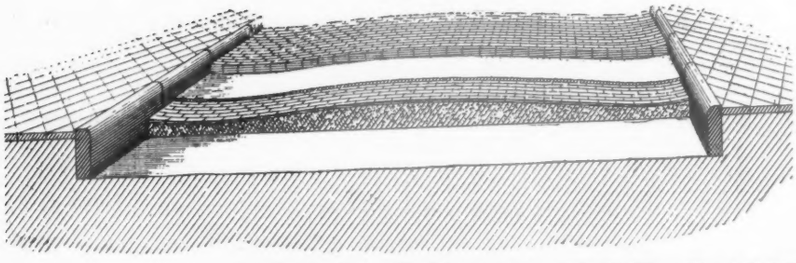
"Ferrolithic" Artificial Stone.

WRITE FOR ESTIMATES.

Contractors for Paving Streets and Sidewalks with the best and cheapest Pavement known.

HAND IN HAND

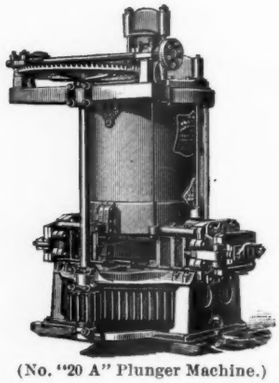
GO



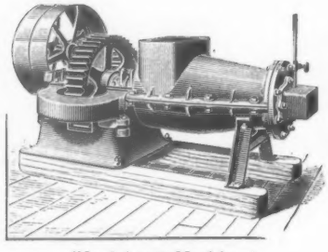
SEND FOR OUR NEW PAMPHLET ON "BRICK PAVEMENTS."

GOOD BRICK FOR PAVEMENTS

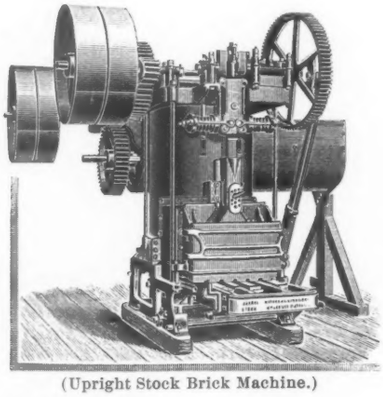
AND



(No. "20 A" Plunger Machine.)



(No. 5 Auger Machine.)

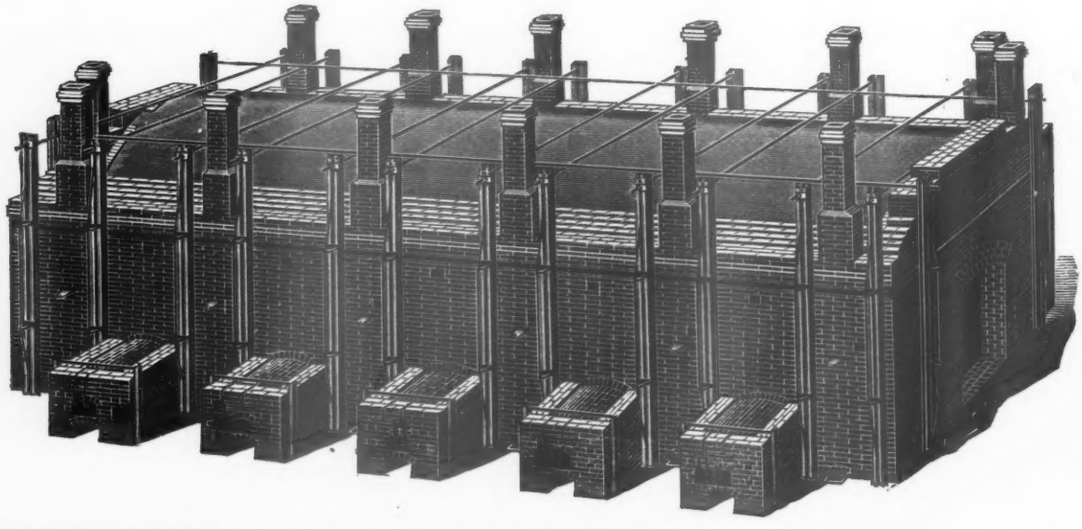


(Upright Stock Brick Machine.)

THE PENFIELD BRICK MACHINERY.

FOR PARTICULARS ADDRESS J. W. PENFIELD & SON, WILLOUGHBY, OHIO, U. S. A.

The ·:· Eudaly ·:· Kiln



Is No Longer an Experiment. Burns All Hard

This kiln is used by a majority of the largest STREET PAVING BRICK PLANTS in the country. It has no superior for FINE PRESSED OR FRONT BRICK. For further particulars

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